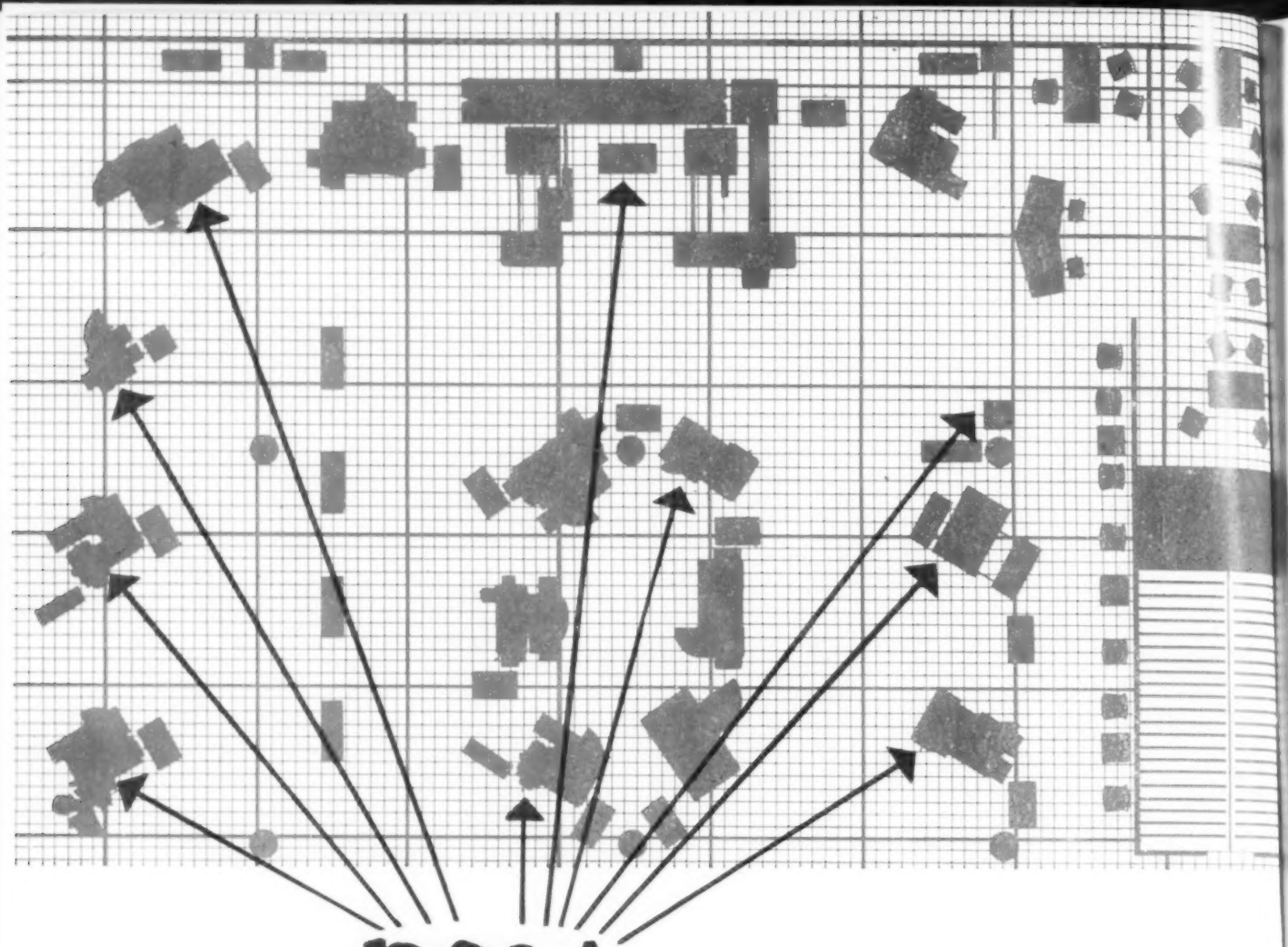
# THE TOOL ENGINEER

AUGUST 1955

AUTOMATIC QUALITY CONTROL

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS



# these new Heald developments are TOP SECRET now

THE SIXTEEN Heald machines shown in the above floor plan of Booth 902, represent the very latest advances in modern precision-finishing methods and equipment.

Some of these machines are completely new—never before shown to the industry. Others demonstrate outstanding new developments and improvements that will mean faster, better production of precision-finished parts. All machines will be in operation, on appropriate work.

Here you will see new machines with mechanical cycling—new automatic sizing methods—new self-adjusting grinding cycles—new wheel dressing procedures—new after-gaging and feedback systems—a fully automated multi-unit borizing setup—and a completely new angle in Bore-Matic design.

This is real progress in precision finishing—progress that means a new, higher return on "the world's best investment, in action".

*...but you are invited*
*to see them all,*
*IN ACTION,*
*in Booth 902*
*at the Machine Tool Show*

IT PAYS TO COME TO HEALD

**THE HEALD MACHINE COMPANY**
**WORCESTER 6, MASSACHUSETTS**

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD

ver: Application of sta-
stical quality-control
nciples in an automatic
the simulate the regula-
n of a continuous proc-
s in the production of
dividual workpieces.
eatures of this machine
e discussed in the article
ginning on page 73.

The Tool Engineer

Volume XXXV, No. 2 August 1955

## TECHNICAL ARTICLES

Help Wanted . . . . . By Harry B. Osborn, Jr. 71
Parts Produced to Size by Automatic Quality Control . By David N. Smith 73
Gadgets . . . . . 77
Machinability Data . . . . . By M. C. Shaw, N. H. Cook and P. A. Smith 81
Helical Carbide Cutters Broaden Scope of Milling . . . By A. O. Schmidt 87
Arc Welding for Small Lots—Tooling the Job . . . . By Arthur H. Allen 89
Designed for Production . . . . . 94
Surface Plates Compared by Physical Tests . . . . By Richard Merriam 99
Reducing Gage Costs With Standard Components . . . . By A. G. Davis 101
Tools at Work . . . . . 106
Finishes for Metals—Processes and Equipment . . By Robert A. Wason 111
Draft Requirements for Die Casting Walls (Reference Sheet) . . . . . 121
Feeds for Knurling (Reference Sheet) . . . . . 122

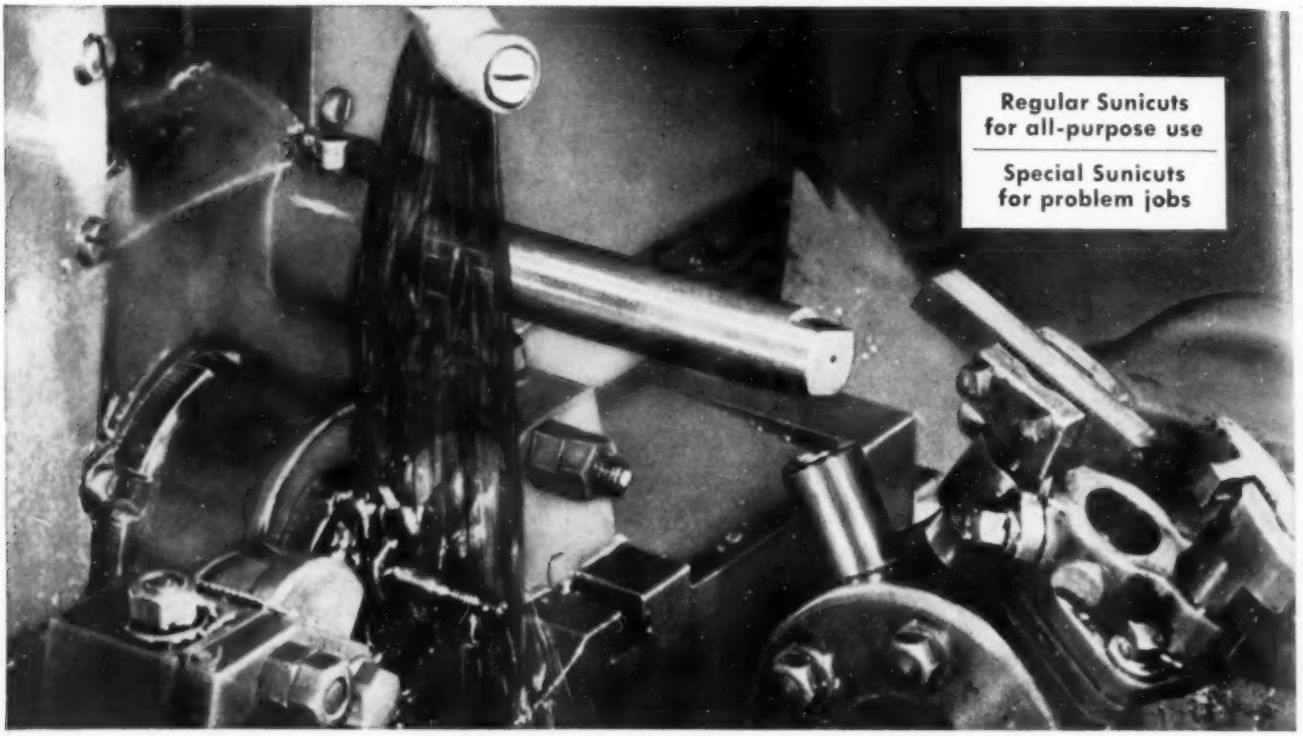
## ASTE NEWS

Featured This Month (Index) . . . . . 123
National Officers and Committee Chairmen Meet . . . . . 125
ASTE Charters 128th Chapter . . . . . 127
New Student Chapters . . . . . 128
Conference at Michigan State . . . . . 129
National Committee Appointments . . . . . 130

## DEPARTMENTS

Abstracts of Foreign Literature . . . . . 166
Field Notes . . . . . 183
Good Reading . . . . . 174
Letter from the Editor . . . . . 3
Men at Work . . . . . 161
Progress in Production . . . . . 141
Technical Digests . . . . . 177
Technical Shorts . . . . . 173
Tools of Today . . . . . 147
Trade Literature . . . . . 163
Who's Meeting—and Where . . . . . 171
Advertisers' Index . . . . . 238

The Tool Engineer is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*




to assure peak production . . .

# THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

For complete information about Sun cutting oils see your Sun representative... or write Sun Oil Company, Philadelphia 3, Pa., Dept. TE-8.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

**SUN OIL COMPANY** PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

Harry E. Conrad
*Executive Secretary*

Allan Ray Putnam
*Publishing Manager*

**Editorial**

John W. Greve
*Editor*

Ralph H. Eshelman
*Associate Editor*

Robert A. Wason
*Associate Editor*

Dorothy J. Taylor
*Assistant Editor*

Alfred K. Abbott
*Assistant Editor*

Nancy M. Houston
*News Editor*

Edith R. Saunders
*Assistant News Editor*

Michael Babala
*Art Editor*

**Business**

Michael Jakesy
*Business Manager*

Clarence T. Etter
*Advertising Manager*
10700 Puritan Ave.
Detroit 38, Mich.

Austin G. Cragg
*Eastern Advertising Mgr.*
400 Madison Ave.
New York 17, N. Y.

Richard E. Cleary
*Ohio Advertising Mgr.*
15515 Detroit Ave.
Cleveland 7, Ohio

Stanley F. Girard
*Western Advertising Mgr.*
540 North Michigan Ave.
Chicago 11, Ill.

Robert E. Ahrensdorf
*Pacific Coast Adv. Mgr.*
1140 Wilshire Blvd.
Los Angeles 17, Calif.

Fay H. LaRoue
*Circulation Manager*

**THE TOOL ENGINEER**

**Executive & Editorial Offices:**
10700 Puritan Ave.
Detroit 38, Mich.

**Publication Office:**
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscriptions: members, $2.00; nonmembers, $6.00; Canada, $6.50, and all other countries, $8.00. Copyright 1955 by the American Society of Tool Engineers.

# The Tool Engineer

## Will It Fail-Safe?

Machines, much like human beings, are accident prone unless protected against themselves. With a worker, safety is largely a matter of education, requiring that he understands the equipment with which he works and appreciates its potential hazards. With a machine, however, added control elements and safety devices are a necessity to protect the worker, the work and the machine.

Most machines do not inherently fail safely, yet it should be the goal of every tool engineer to assure that each machine, insofar as possible, embodies fail-safe operation. Fail-safe provisions have a tendency to cascade control components. Each element protects another like a fuse guarding a fuse. Cost, space and investment are involved. Good judgment and sound engineering must be the criteria whether the devices are mechanical, hydraulic, pneumatic, electric or electronic.

Electronic controls generally have limitations in this respect. They may or may not fail safely. As controls become more complicated these problems are multiplied. The probability of a protective device failing at the same time that the guarded element fails should be determined. As a safeguard, the protecting device usually operates only as a safety measure, minimizing the factors of wear and adjustment.

Electronic fail-safe control is a feature in the Fay lathe discussed in the lead article of this issue. Employing principles of statistical quality control in the adjustment of the cutting tool, as well as for inspection of the finished workpiece, the lathe utilizes four thyratron tubes. To assure their functioning, each of the thyratrons is fired in turn at the end of each machine cycle. If one should not function, the machine stops, indicating that the last piece produced may be out of tolerance.

As machines and processes become more automatic, the controls for proper operation likewise become more important. Almost equal in importance to the operation of the machine itself are provisions for assuring that any malfunctioning will be in the safe direction.

John W Greve

EDITOR

STANDARD®

# Dial Bore GAGES

World's WIDEST Range!

World's SMALLEST Dial Bore Gage!

NOW down to 1/16"

STANDARD GAGE, originator of the efficient, dependable, easy-handling, easy-reading Dial Bore Gage, now offers the world's widest range in these instruments, *covering diameters from 1/16" up!*

Wholly self-contained, light in weight, simple to handle, each size, largest to smallest, is highly accurate and practical for use at machine or inspection bench.

SMALLEST DIAL BORE GAGE IN THE WORLD

The newest member of the family, No. 8/0, covers a range from .062" to .079". It is one of a group of seven mini-size gages with a range from .062" to .380". Utilizing STANDARD's unique centering-size disc principle, these gages are automatically positioned in the bore, with a solid reference point directly opposite the gaging plunger. Easy interchange of discs permits quick conversion to various sizes within the over-all range of the gage. Discs may be had to fit individually specified bore dimensions or in complete sets for each size gage. For example, nine discs in progressive sizes are available in the .062"-.079" range of No. 8/0; twenty-seven discs in the .247"-.380" range of No. 2/0.

STANDARD Dial Bore Gages are available in pistol-grip types, vertical types and special types to meet unusual needs. Bring your bore gaging problem to STANDARD; simple or difficult, we have a Dial Bore Gage to solve it.

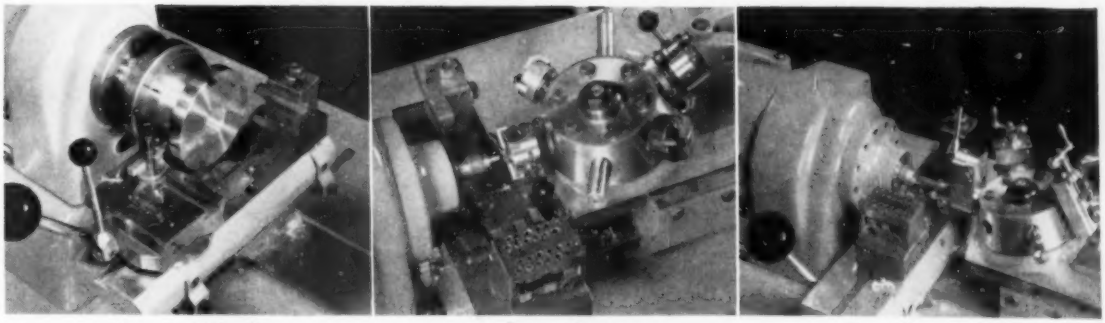
***Write for detailed information***

**STANDARD GAGE COMPANY, INC.**

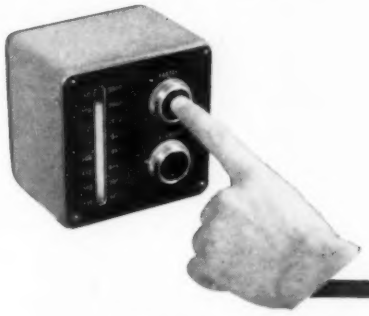
**31 PARKER AVENUE • POUGHKEEPSIE, N. Y.**

HARDINGE
ELMIRA, N.Y.

# NEW Variable Speed Machine for PRODUCTION DEPARTMENTS



Large Work | Threading | Small Work



## Simply Push a Button for Exact Spindle Speed

## Produce More Precision Parts at Lower Cost with this NEW Second Operation Machine

*Send for Free illustrated Bulletin DSM59*

**HARDINGE BROTHERS, INC.** ELMIRA, NEW YORK, U.S.A.

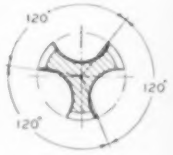
OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette Street, New York 12, N. Y.

# BALANCED *Action* PERFORMANCE

## Taps with these four craftsmanship-qualities will deliver it—All Winter Taps Have It

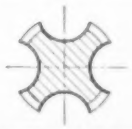
**EXACT FLUTE SPACING**

is the first fundamental of Balanced Action. It is accomplished by precision indexing.



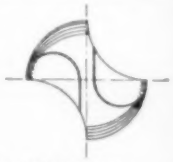

**UNIFORMITY OF FLUTE CONTOURS**

is essential, of course. You can't get Balanced Action without it.



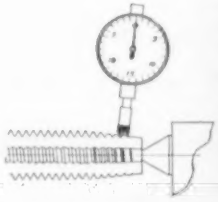
**PRECISION CHIP DRIVER CONTOURS**

are exact to size, shape, and position—formed to give the finest performance.



**ACCURATE AND CONCENTRIC CHAMFERS:**

By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.



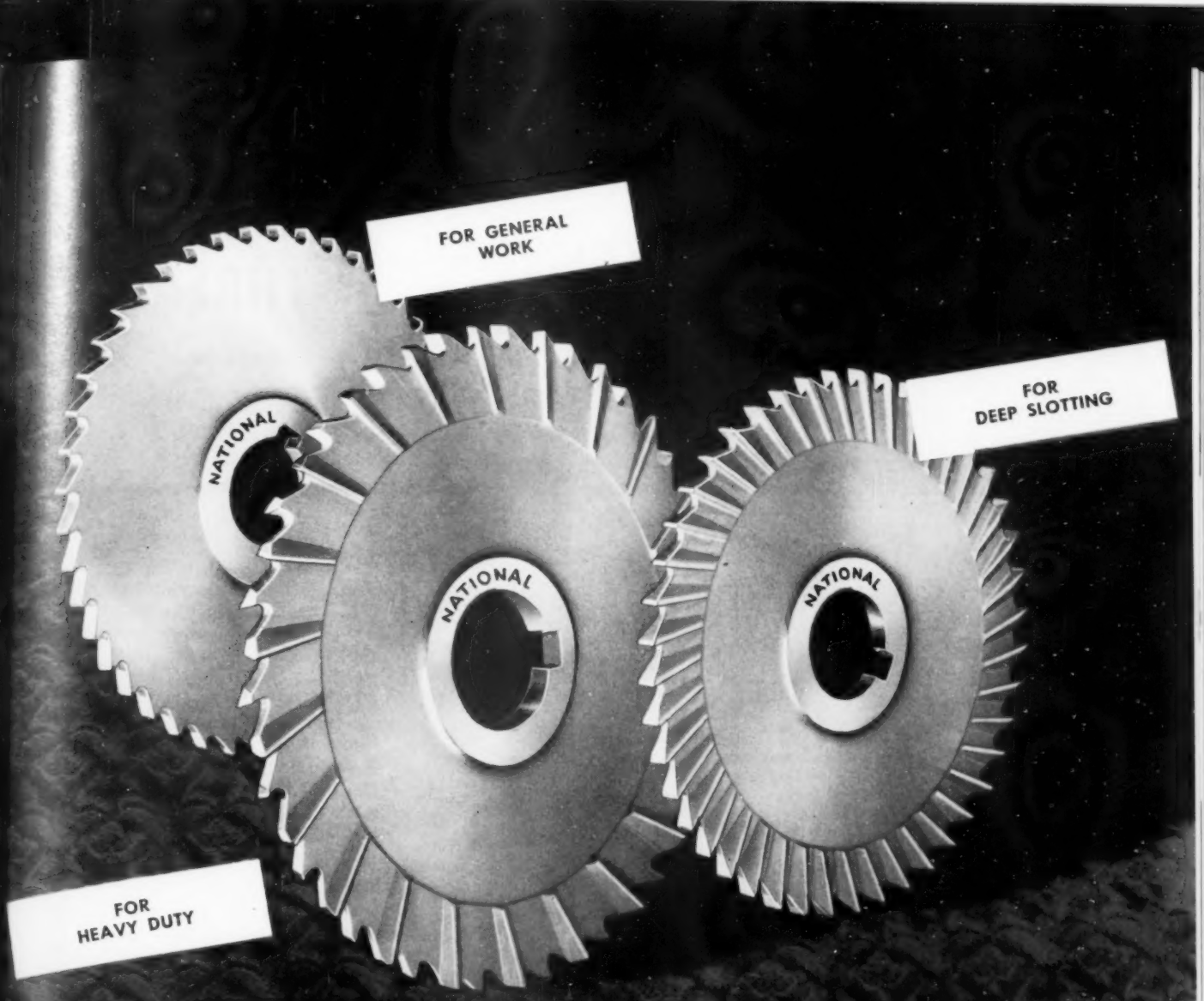
WINTER®

**WINTER GAGES**
plug and ring, thread and plain are made with "Balanced Action" accuracy

CALL YOUR WINTER DISTRIBUTOR

**WINTER BROTHERS COMPANY,** Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago
Dallas • San Francisco • Los Angeles • Division of National Twist Drill & Tool Co.




# National

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A. ®

## The bite that's right for your sawing and slotting

Smooth. No binding, no scoring. Saws with National cutting edges do the job the way you want it done. Immediately available—a wide range of diameters and widths; also many special types of saws and slotting cutters.

CALL YOUR NATIONAL DISTRIBUTOR

**NATIONAL TWIST DRILL AND TOOL COMPANY**

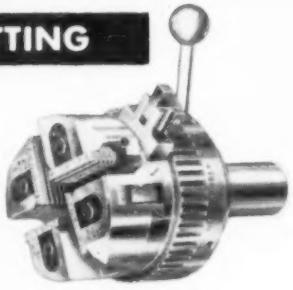
**Rochester, Michigan, U.S.A.** Distributors in principal cities. Branches in New York Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

TWIST DRILLS • REAMERS • COUNTERBORES • MILLING CUTTERS • END MILLS • HOBS • CARBIDE TIPPED AND SPECIAL TOOLS

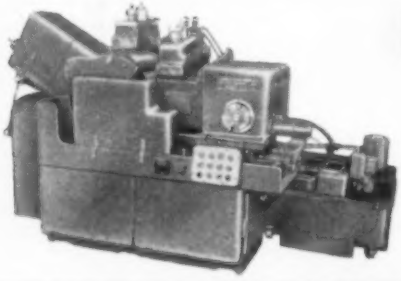
THE MACHINE TOOL SHOW
BOOTH 1406

CUTTING
GRINDING
TAPPING
ROLLING
THREADS

CUTTING

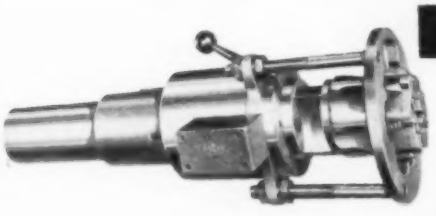


The 8C LANDMACO—one of five *new* Thread-Cutting machines to be demonstrated. These machines are designed for precision threading of workpieces from 3/16" to 6 5/8" in diameter. Above is the new 2" LANDMATIC —one of the many Standard and Special Thread-Cutting Heads on display designed for application to Automatics and Turret Lathes.



GRINDING

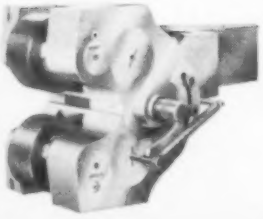
The CENTERLESS Thread Grinder — to be shown in operation — for infeed and thrufeed grinding of threads from 1/16" to 4" in diameter at mass production rates.



TAPPING

The LL Collapsible Tap for producing internal tapered threads featuring detachable heads for wide range coverage. On display will be Rotary or Stationary Standard Taps for straight or tapered threads, Solid Adjustable Taps, Valve Taps, and Taps for other special applications.

ROLLING



The *new* LANHYROL Thread Rolling Machine — shown in a variety of demonstrations—revolutionary in its output, accuracy, and flexibility. Above is the #20 LANROLL Attachment—one of five sizes of Thread Rolling Attachments for Automatics and Turret Lathes to be displayed.

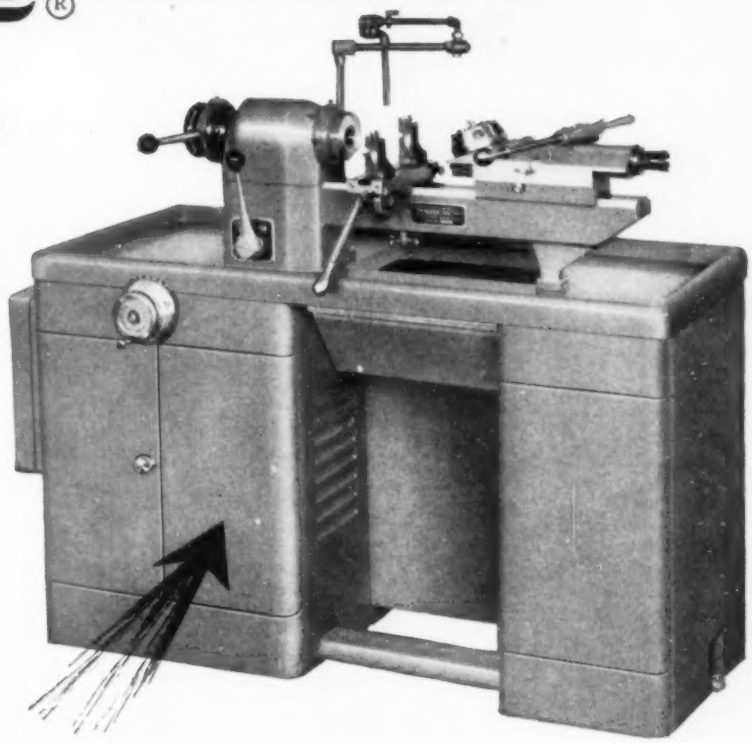
441

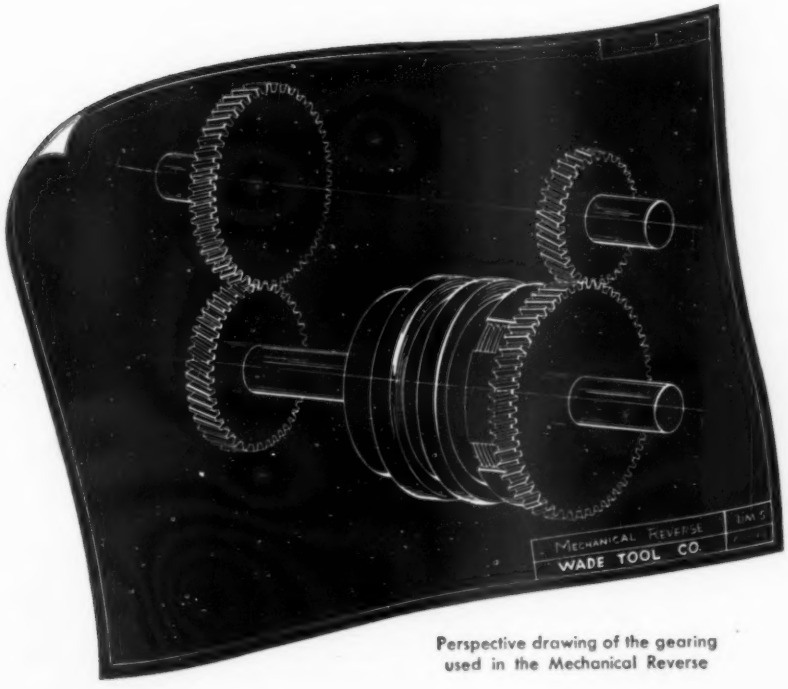
LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

# the Wade® REVERSE*

## CONTINUOUS REVERSE

The arrow indicates the location of a feature that is built into the Wade #73, and **obtainable on no other second operation machine . . .** it's the production-tested **Mechanical Reverse.**






Perspective drawing of the gearing used in the Mechanical Reverse

## no. 73 Hand Turret Lathe

A single lever mounted on the lathe bed not only controls the high-low spindle speeds of 5-to-1 ratio, but it also actuates the Mechanical Reverse. This lever brakes the headstock spindle and throws it into reverse **without stopping and starting the motor!**

Cycles of up to 32 reversals per minute allow production increases of as much as 100% on your tap or die work.

If this feature interests you, investigate the full advantages of the Wade No. 73 by writing today for a circular illustrating this versatile machine.

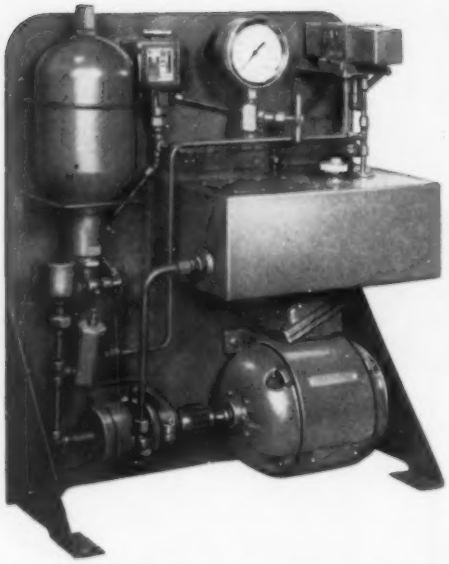
*Wade Exclusive, Patent applied for *write for descriptive folder and prices* | 59 River St.

**THE WADE TOOL CO.** | MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

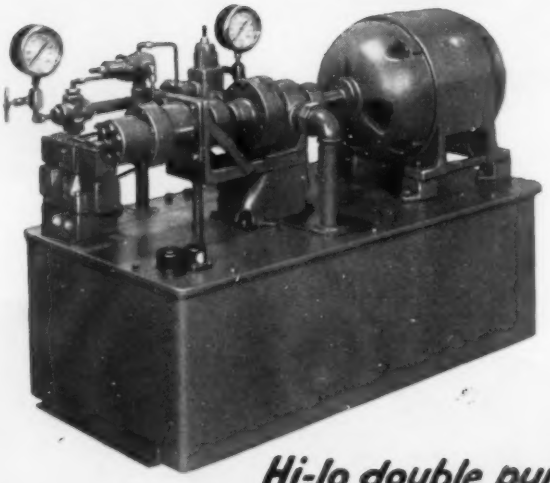
WALTHAM 54, MASS., U. S. A.

# WHICH POWER UNIT DO YOU NEED?

Standard?



Panel mounted package?



Hi-lo double pump?

**RIVETT can supply the exact power unit to meet your requirements!**

**STANDARDS** are available in 17 models at continuous working pressures up to 1000 P.S.I. and 1500 P.S.I. Single pumps are offered in six tank sizes. Capacities from .4 to 40 G.P.M. Double pumps are offered in four tank sizes with combined capacities from 3.5 to 80 G.P.M.

**CUSTOM-BUILT POWER UNITS** are offered for pressures up to 5000 P.S.I. They are designed to accommodate unusual requirements of space, size, piping, valving, mounting, or operation.

**The better you know hydraulics — the better you like**

Get Fact-filled Catalog! →

H. P. requirements, specifications, drawings fill this easy-to-use booklet. Write for free copy today!

**RIVETT LATHE & GRINDER, Inc.**
Dept. TE-8 Brighton 35, Boston, Mass.
*Representatives In All Principal Cities*

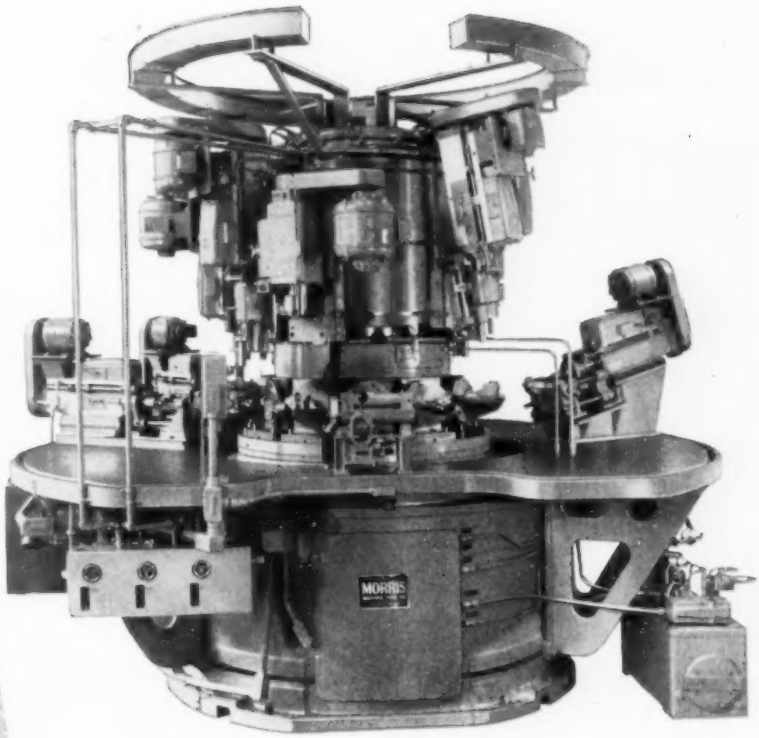
**RIVETT furnishes a complete power package**

***AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS***

*Member — National Fluid Power Association*

# Eliminates model change-over problems!

**a production machine—with standard units—quick change-over features—for each year's design change. completely automatic—requires only part loading and unloading.**




Morris Unit-Type Machine Tools provide specialized machining; use standard components; add flexibility to your high speed mass production operations.

Unit type construction provides for realignment for model alterations or for new models. No longer any need to scrap an entire machine!

MORRIS MOR-SPEED PRODUCTION MACHINE . . . drills, burrs, reams, taps, spotfaces carburetor air horns . . . 375 pieces per hour at 80% efficiency.

Basic construction provides a stationary center column and Morris AIR-OIL-MATIC Drill Units mounted on the column and on the removable platen. Parts are placed in air-power clamped fixture by the operator. The table indexes automatically through 12 stations, controlled by hydraulic indexing mechanism. 24 operations on 21 holes on 4 perpendicular faces and one angular face are performed on each piece. Operator merely loads unfinished pieces, unloads completed parts.

*Write for new detailed descriptive literature . . . or outline your mass production problem involving drilling or related operations for prompt attention by MORRIS engineers.*

## MORRIS AIR-OIL-MATIC DRILL UNITS

- Adjustable Feed, Stroke and Rapid Approach
- Trouble-free Hydraulic System
- Wide Range of Spindle Speeds
- Convenient Controls
- Air or Oil Powered
- Hydraulically Controlled

Designed for a wide range of drilling, reaming, chamfering, spot-facing, hollow milling, centering and related operations, the unit can be mounted in vertical, angular or horizontal positions. Controls may be set to provide almost any sequence of operation. Available for use in special purpose machines like the production machine illustrated.

VISIT US AT BOOTH #912
THE MACHINE TOOL SHOW
Chicago, Illinois, Sept. 6-17, 1955
*International Amphitheater*

THE MACHINE TOOL SHOW MT

Morris

**THE MORRIS MACHINE TOOL CO.**
950 HARRIET STREET . CINCINNATI 3, OHIO

# Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

## 2 Fine Tool Steels Team Up to Make Compound Die

This compound blanking, forming and piercing die is used by National Motor Bearing Co., Redwood City, Calif., in the production of cup cases for oil seals. The die is made up of two grades of Bethlehem tool steel: BTR and Lehigh H.

Hardened to Rockwell C 60-61, the long-wearing die forms the cup cases from plain carbon steel, stainless steel, and brass sheets. They range in diameter from ½ in. to 14 in., and in thickness from 0.030 in. to 0.090 in. The die produces parts to tolerances of plus or minus 0.002 in., and produces up to 75,000 pieces before slight redressing is required.

BTR (Bethlehem Tool Room) is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Its main feature is its safe-hardening property. This, coupled with its sound combination of wear-resistance and toughness, makes BTR an ideal steel for all general-purpose tool and die applications.

Lehigh H is a high-carbon, high-chromium tool steel. It offers maximum wear and minimum distortion in heat-treatment. It is also a deep-hardening steel, in air, and thus has high compressive strength.

Your tool steel distributor will be pleased to furnish additional information about these fine Bethlehem tool steels. He'll welcome your call, right now.

### BETHLEHEM TOOL STEEL ENGINEER SAYS:

*Why and How to Stress-Relieve Tools*

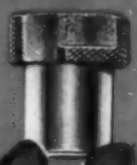
Stress-relieving is performed on tools to partially remove residual stresses resulting from machine work, mechanical straightening, hobbing, or other cold working. The reduction of stress is important in avoiding excessive distortion during tool hardening, as well as in avoiding the cracking that results from the addition of residual stress to the thermal stress produced when heating to the hardening temperature.

Stress-relieving is accomplished by heating the steel to from 1100 to 1300 F. Because of the relatively low temperature, surface protection against scale or decarburization is usually not required. As the temperature used is always below the transformation range of the steel, the rate of cooling is unimportant, except that it must not introduce thermal stress during cooling. Only a portion of residual stress is removed by this procedure. Up to the lower critical, the higher the stress-relieving temperature, the more completely is the stress removed.

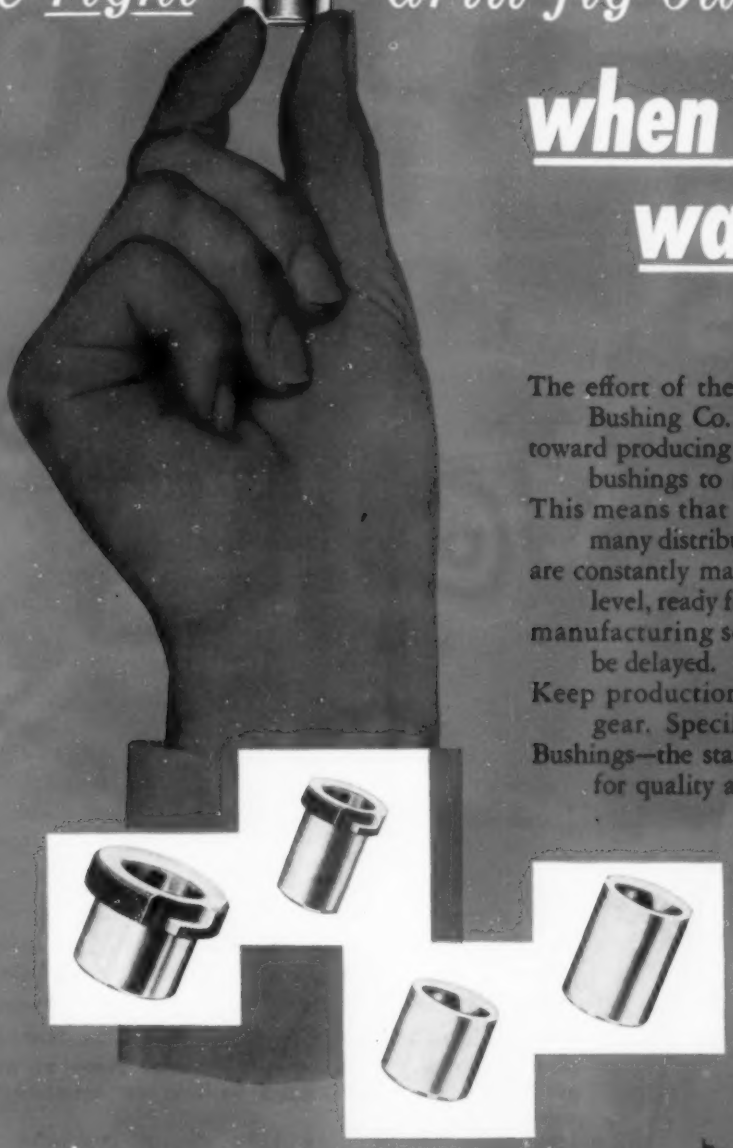
The degree of stress-relief afforded in this manner is usually sufficient. However, if complete relief of stress is required, a full anneal practice should be employed, including full austenitization and slow furnace-cooling.

### TUBE MANDREL FOR SERVICE IN EXTRUSION PLANT

Shown during a finishing cut, this tube mandrel will see service in the extrusion plant of Kaiser Aluminum & Chemical Corp., Halethorpe, Md. The mandrel is made of Bethlehem Cr-Mo-W (chrome-moly-tungsten) tool steel. Cr-Mo-W is an all-around hot-work steel containing 5 pct chromium. It is especially suited for jobs that involve shock and drastic temperature changes, as well as for jobs where heat-checking is a problem.

*the right*  *drill jig bushing...*

**when you want it!**



The effort of the entire American Drill Bushing Co. organization is directed toward producing *precision* drill jig bushings to meet your requirements. This means that the stocks at our many distributors throughout the U.S. are constantly maintained at a high level, ready for your call...so that your manufacturing schedules will not be delayed.

Keep production rolling in high gear. Specify American Drill Jig Bushings—the standard of comparison for quality and accuracy.

LOOK FOR THE TRADE MARK

SEND FOR NEW CATALOG W4 AND NAME OF NEAREST DISTRIBUTOR

*American*

Serves the U.S. Best!

**AMERICAN DRILL BUSHING CO.**

5107 PACIFIC BLVD. • LOS ANGELES 58, CALIFORNIA

SPECIALIZING ONLY IN DRILL JIG BUSHINGS

# SPEED RECORD BROKEN

## 2,000 Horse Power Motor Shafts

## ROUGH and FINISHED in

## 2¼ hrs.

**Former Time**
**9 hours**

Fairbanks, Morse & Co., Beloit, Wisconsin, is getting this amazing production day after day on its *20 inch "AMERICAN" All-hydraulic Duplicating Lathe.*

These shafts are made from 7½" diameter by 84" long hot rolled stock weighing 1059 pounds. A 30 horse power roughing cut and 15 to 20 horse power finishing cut completes the operation.

Note particularly that a finish turned motor shaft is used for a template, showing the rugged stability of "AMERICAN" Template Supports.

The quality of Fairbanks-Morse's products are universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to them. "AMERICAN" Hydraulic Duplicating Lathes hold many production records for work of this nature. Let us show you what they will do on your work.

***Send for Bulletin No. 35.***

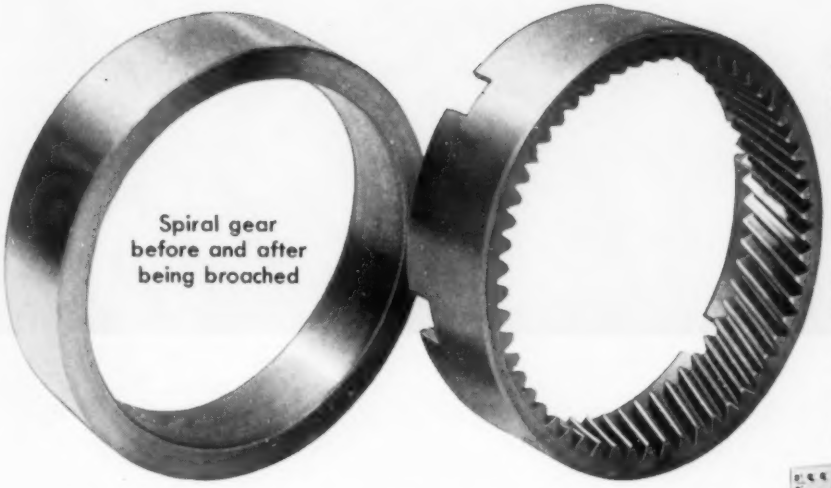
**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

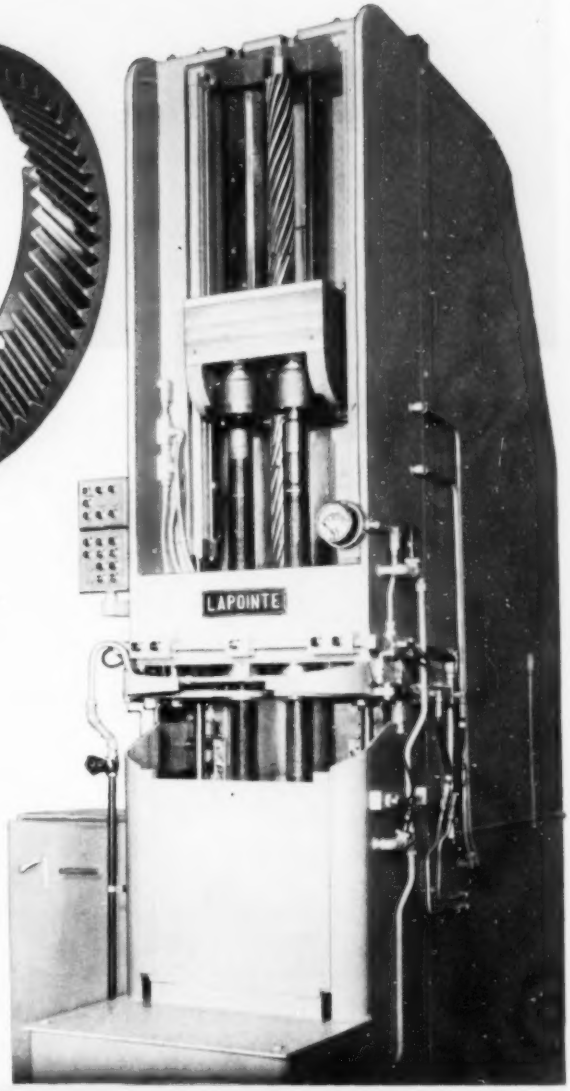
# BROACHING without CHATTER

## is easy, on the LAPOINTE VUE-7

## *the world's first* ELECTRO-MOTIVE POWERED *pull-up* BROACHING MACHINE



Spiral gear before and after being broached




Built for high production, and using two identical broaches rotated in true synchronism by a sturdy lead bar, this new LAPOINTE machine broaches **helical internal gear automotive parts** two at a time, at a rate of 320 parts per hour . . . at 80% efficiency!

No wonder that it **broaches without chatter:** it has massive, quiet gears . . . a heavy, rigid frame . . . and electro-motive drive! No wonder, either, that because of these features the work is more accurate, and tool life is increased 400% to 500% between grinds!

**LAPOINTE VUE-7**

for broaching speeds of 10 to 100 feet-per-minute.

Can be built in other types and sizes up to 50 tons.

Send today for literature. Ask for Bulletin VUE-7-5.

**THE LAPOINTE MACHINE TOOL COMPANY**
**HUDSON, MASSACHUSETTS • U. S. A.**
*In England: Watford, Hertfordshire*

HUDSON LAPOINTE MASS

**THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES**

# Special Punches and Die Buttons

# have R-B Standardized Features

You can save time in die designing, construction and use by adopting as standard the most widely accepted piercing system in the industry. This standardized R-B system efficiently answers the need for trouble-free piercing on both simple and complex applications.

Special punch-points and mating die buttons of any shape or size can be made to your specifications and will have all the features of standard R-B equipment. These inherent R-B features include: snap-action radial alignment and vertical locking of special punches and die buttons, speed and ease of insertion or removal, and complete interchangeability. Just a push, a twist and "click" the R-B punch or die button is locked in the retainer —no additional keying required.

4568

***Use R-B Engineering Service For Your Tough Piercing Problems.***

**RICHARD BROTHERS PUNCH DIVISION**
**ALLIED PRODUCTS CORPORATION**
DEPT. 83 • 12667 BURT RD. • DETROIT 23, MICHIGAN

*Please send me additional information.*

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

**ALSO PRODUCED IN OTHER ALLIED PLANTS**

SPECIAL COLD FORGED PARTS

FERROUS POWDERED METAL PARTS

STANDARD CAP SCREWS

PRECISION GROUND PARTS

SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

# Production Pointers from GISHOLT

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 9-17, 1956
INTERNATIONAL AMPHITHEATER

BOOTH 1413

MASTERLINE
GISHOLT
SINCE
1887

The Gisholt MASTERLINE medallion will identify this new and improved series of machines to be shown for the first time at the Machine Tool Show in Chicago in September. See them at work in Booth 1413.

# PRE-SHOW ISSUE

## SINGLE PASS *JETRACER* IS DOUBLE-TOOLED TO SPEED PRODUCTION

### *Unique Setup on No. 12 Automatic Lathe Cuts Costs on Differential Gears*

Jobs like this may open your eyes to some new money-saving ideas with the Gisholt *JETRACER* unit. Here's how this manufacturer does it:

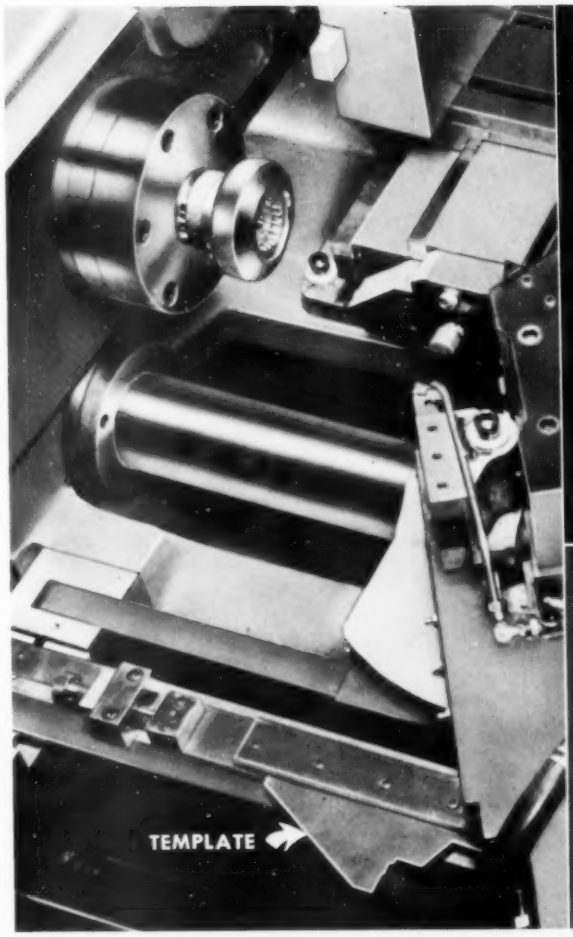
To machine steel forgings for differential gears, two No. 12 Automatic Lathes are equipped with *JETRACER* units, both of which are double-tooled. Gears are held on a segmented-sleeve type air-operated expanding mandrel and driven by a key in the splined I.D. Double-tooling on both tracer slides makes it possible to complete each operation in a single pass.

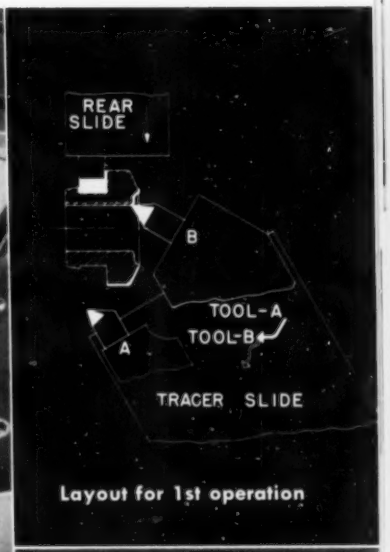
The line drawing illustrates the first operation. Tool "A" faces the bevel, chamfers the edge and turns the O.D. As tool "A" completes its cuts, tool "B" engages work, facing, co-boring, facing the co-bore and chamfering the corner of the splined I.D. Meanwhile, the rear slide feeds in with a single tool to face the back of the flange and shave-turn part of the hub. Floor-to-floor time is a fast 0.8 minute.

The second operation on the other end is completed in the same manner on the second No. 12 Automatic Lathe, also in 0.8 minute. One operator handles both machines to keep production humping.

***It's the combination of smart tooling on the JETRACER unit with the speed of the No. 12 Automatic Lathes that accounts for the swift, accurate production of these parts.***

*(If you'd like to see more cost-cutting* JETRACER *applications, ask for folder —Form 1171.)*




Layout for 1st operation

Work piece for 2nd operation

Machining of these differential gear blanks is done with setup shown in drawing. Tools on tracer slide engage in quick succession while simultaneous cut is made with rear slide. Note template for tracer follower at bottom of machine photo.

### At the SHOW:

No. 12 and 24 AUTOMATIC LATHES—See single and multiple passes with *JETRACER* Unit. Three new models; one with full automation.

TIME-SAVING IDEAS

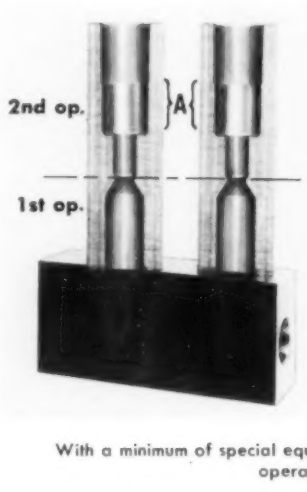
# CUTS COSTS BY COMBINING INTERNAL MACHINING AND BURNISHING

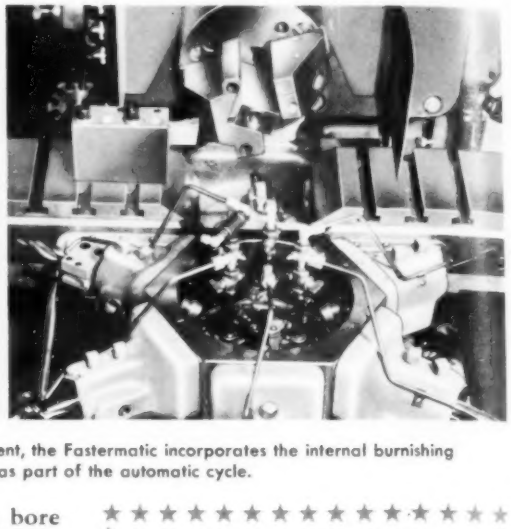
### *Fastermatic Automatic Cycle Is the Answer*

To cut costs on these steel block check valve bodies, the producer wanted them internally machined and burnished in two sequential operations on two 1F Fastermatic Automatic Turret Lathes.

By using a special two-jaw air chuck, the job was quickly and simply accomplished. Used for both operations, the special chuck has one stationary jaw, V-block shaped, to locate the work on center, with a dead stop at the rear for longitudinal location. The second jaw clamps the piece by moving in and out.

In the first operation, the valve seat is drilled, formed and reamed; the large bore is taper reamed; and the valve body is faced on one end. Time: 1.46 minutes. In the second operation, the other end of the piece is drilled, bored, co-bored, chamfered and reamed. The operation is then completed by feeding a special turret-mounted burnishing tool into bore "A" to obtain a 20 micro-inch R.M.S. finish. Time: 1.78 minutes.



With a minimum of special equipment, the Fastermatic incorporates the internal burnishing operation as part of the automatic cycle.

***Total time for the first operation is only 1.46 minutes, and only 1.78 minutes floor to floor time is used for the second operation—including burnishing bore "A" to a 20 micro-inch R.M.S. finish.***

**AT THE SHOW:**

FASTERMATICS—continuous automatic operation. New setup features make small lot production economical with simple, fast changeover.

# TWO CHUCKS ON SADDLE TYPE LATHE HANDLE LONG WORKPIECES

### *Long oil well drill tubes machined quickly, easily with this setup*

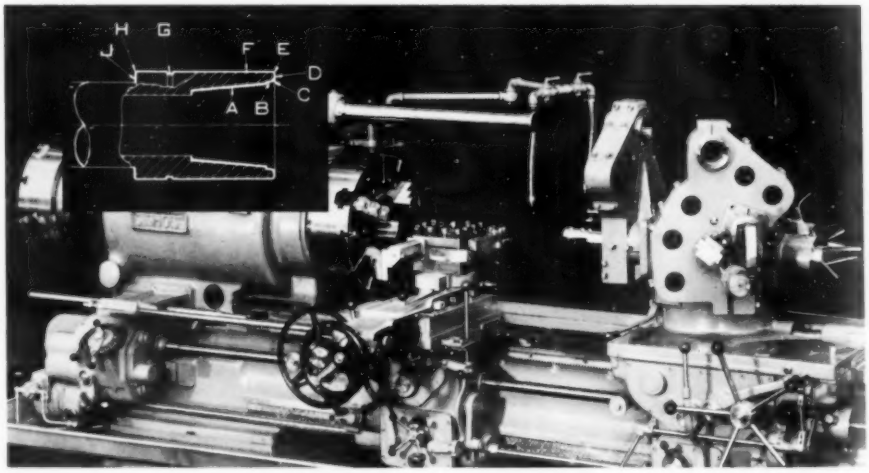
What's the fastest, easiest, safest way to hold an oil well drill tube and machine on end?

Here's one way of doing it:

The long tube is "double-chucked" in a 4L Saddle Type Turret Lathe, using two 24″ 3-jaw scroll chucks, one at front and one at rear of the spindle. Result: whip is prevented; distortion is avoided.

Machining is low-cost and simple. First, "D" is faced from the square turret. Next, "A" is step-bored from two multiple-tooled stations on the hexagon turret, which also rough and finish co-bore "B," chamfer "C" and "E" and turn "F." Two more stations on the hexagon then rough and finish taper ream "A," and a special holder on the square turret simultaneously grooves "G," chamfers "H" and faces "J."

"A" is then single-point threaded, using the full-length lead screw and a special taper attachment cam on the square turret carriage. This completes the job.




***Machining long workpieces without whip and distortion is simple, fast and easy with this two-chuck setup on a Gisholt Saddle Type Turret Lathe.***

**AT THE SHOW:**

SADDLES—new higher speed, more powerful machines. *JETRACER* will be demonstrated on both bridge type cross slide and hexagon turret mounting.

# T E SHOW . . . SEE GISHOLT!

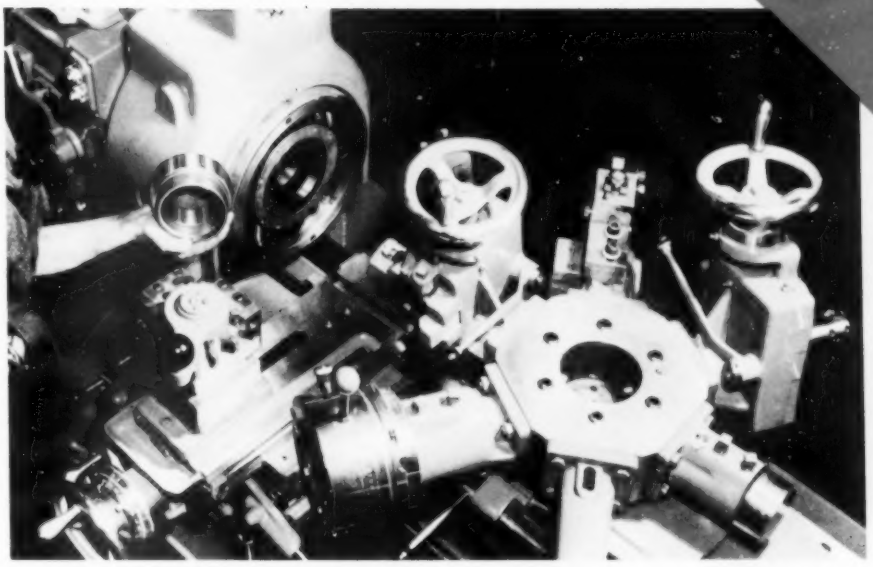
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 9-17, 1958
INTERNATIONAL EXPOSITIONS

BOOTH 1413

## E'S EXTRA SPINDLE BORE CAPACITY WITH UTSIDE-OPERATED OLLET CHUCK

Here's a good idea to keep in mind: You can work right up to the limit of your spindle bore capacity. This producer is doing it with his Gisholt No. 5 Ram Type Turret Lathe, tooled to machine threaded adapter bushings from 4⅝" seamless steel tubing. An outside-operated collet chuck does the trick.

Tooling is also well planned. Parts are finished in minimum time—only 4.2 minutes floor to floor. Hexagon turret tools bore, co-bore, turn, form, chamfer, thread the O.D. and tap the I.D. Square turret tools face and chamfer with cut-off from the rear tool post.



*An outside operated collet chuck arrangement provides the extra capacity needed to complete this job and permits using a smaller, less expensive machine.*

**AT THE SHOW:**

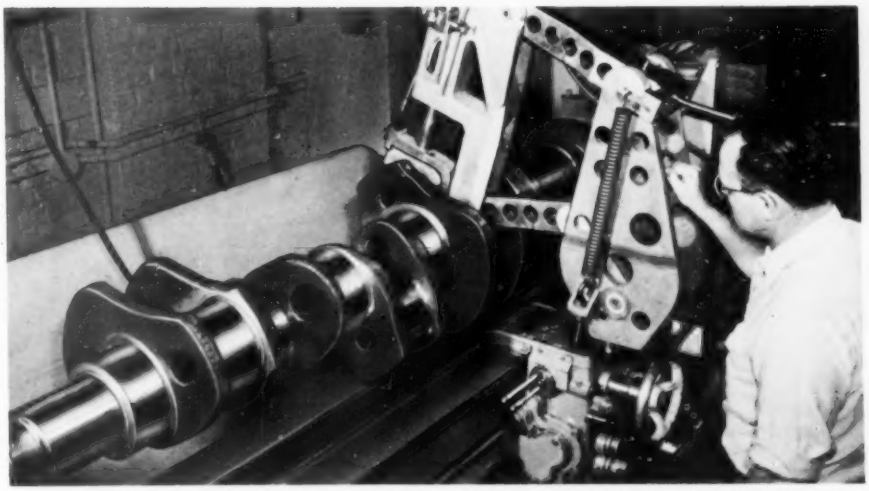
See new Ram Type models, including the 4½" spindle bore No. 5. Also, first showing of the new Electram for high-speed, automatic operation on small parts.

## HOW TO SUPERFINISH CRANKSHAFT BEARINGS ON A LATHE

***No. 4 attachment makes possible smoother surfaces with very small investment***

Even on limited production, you can take advantage of the benefits of Superfinishing. Attachments can be mounted on your own lathe, thus saving the cost of a special machine. In this case, large diesel engine crankshafts, main and pin bearings are Superfinished in one operation. Costs are held low by a Superfinishing attachment with a special latch-on type, follower-arm.

Nine bearing surfaces are Superfinished with four minutes stone contact time per bearing and one minute to position the attachment for the next bearing. A final surface finish of 3 to 5 micro-inches R.M.S. is attained, compared to 25 to 30 micro-inches R.M.S. before Superfinishing.



*This special Superfinishing attachment on existing equipment eliminates polishing and lapping operations to insure better crankshaft performance.*

**AT THE SHOW:**

SUPERFINISHERS—machines working continuous runs and job lots. Demonstrations to show reasons for Superfinish and how to control size.

*TALK TO GISHOLT ABOUT MACHINE TOOL LEASING*

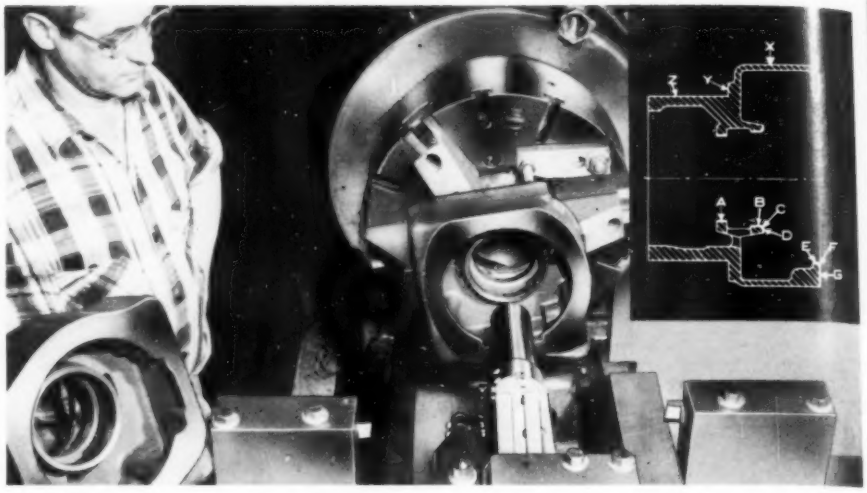
GISHOLT

GISHOLT

TIME-SAVING IDEAS

# AWKWARD GEAR HOUSINGS HANDLED EASILY THROUGH SMART TOOLING

*Simplimatic setup with 9 tools, bores three diameters simultaneously*




The manufacturer of a well-known farm tractor line had a problem in machining the awkward cast iron gear housing you see here. Smart tooling and the Gisholt Simplimatic Automatic Lathe are proving the answer.

The operator sets the rough workpiece on a special angle plate bracket providing a loading rest. This bracket also serves as a work-driver. Work is then placed against jacks at "Y" and chucked on the long hub at "Z" in a 3-jaw air chuck.

The center slide carries a piloted boring head. This is used for rough and finish boring "A," "B" and "E" as well as chamfering "C" and "F" and facing "D." When this work is completed, the head holds up while front and rear slides rough and finish face "G." This provides complete concentricity for all surfaces and gives excellent finishes free of tool interference.

Through the speed and economy of operation provided by the Simplimatic Automatic Lathe, floor-to-floor time on this job is only 3.4 minutes. Fourteen pieces are produced per hour, with 80% efficiency.

***Three diameters are bored simultaneously in awkward workpieces by combining careful tooling with the versatile Simplimatic.***

**AT THE SHOW:**

SIMPLIMATICS—50 h.p. machine on bevel gear blanks. Many new machine features include greater spindle speeds and automatic lubrication to the slides.

# BALANCER HAS WELDING UNIT FOR ON-THE-SPOT CORRECTIONS

Correction equipment—either by addition of weight such as operator indicates here, or by weight removal, can be incorporated by any Gisholt Balancing Machine. New Type S catalog, Form #1165, gives complete details.

*High Production Setup for Balancing Automotive Flywheels*

You know the speed, efficiency and accuracy of manufacturing operations demanded by the automotive industry. Here's how vital balancing of automotive flywheels measures up to these requirements. This Gisholt 1SV1 Static Balancer measures, corrects and inspects these flywheels at a rate of 36 seconds per part.

It's a simple operation. As the flywheel is rotated, the Amount Meter tells the operator exactly how many correction lugs are needed. The strobe lamp, flashing on the numbered dial below the part, indicates where they are to go.

Welding equipment, mounted right on the machine, permits correcting the parts for balance in a single handling. The operator places the correction lug against the upper electrode of the welding gun where it is held magnetically until applied at the indicated angle. Then, a quick check to assure the part is within the prescribed tolerance—and the operation is completed.

***Maximum efficiency and accuracy are attained by combining measurement, correction and inspection for balance in a single, fast operation.***

**AT THE SHOW:**

BALANCERS—See actual production runs and demonstrations. Bench, vertical and large-capacity machines in use on static and dynamic balancing jobs.

No. 7-855
640

**THE GISHOLT ROUND TABLE** represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

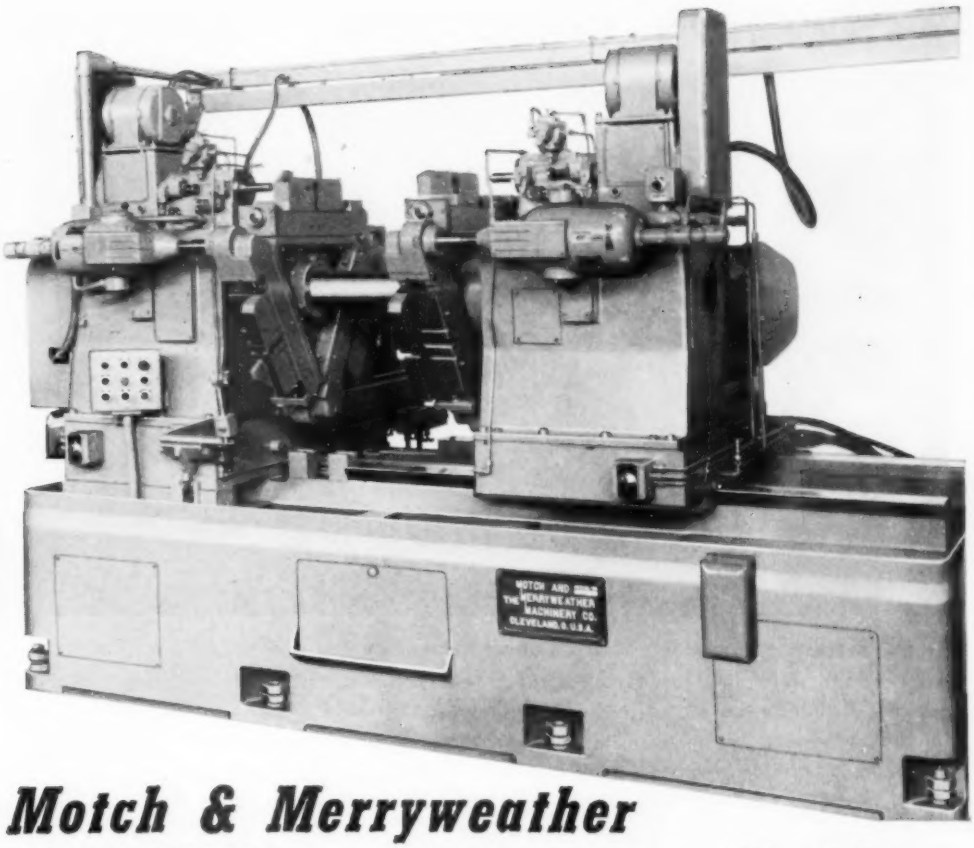
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Heavy Duty

Rigid

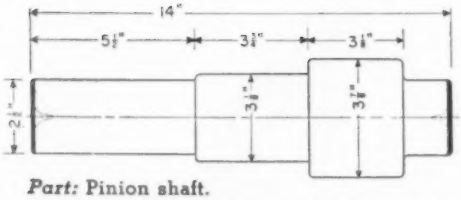
Accurate

Productive



# *The Motch & Merryweather*
# No. 3-MCT Milling and Centering Machine
## FOR UNIVERSAL PRODUCTION

## *Adopt this Active Asset to Automation*




*Part:* Pinion shaft.
*Operation:* Mill and center drill both ends.
*Production:* 220 pieces per hour.

Mass production, yet with extreme accuracy, — that is the central requirement for preparing parts which go to your automatic equipment. Begin automation *right* by preparing your parts *right* on the Motch & Merryweather 3-MCT Milling and Centering Machine. This universal heavy duty unit excels for high single-purpose production, while quick set-up makes short runs profitable. Automatic loading and unloading may be incorporated to handle extremely high production. The 3-MCT performs with a dispatch and precision hitherto unknown.

THE MACHINE TOOL SHOW CHICAGO, ILL. BOOTH 606

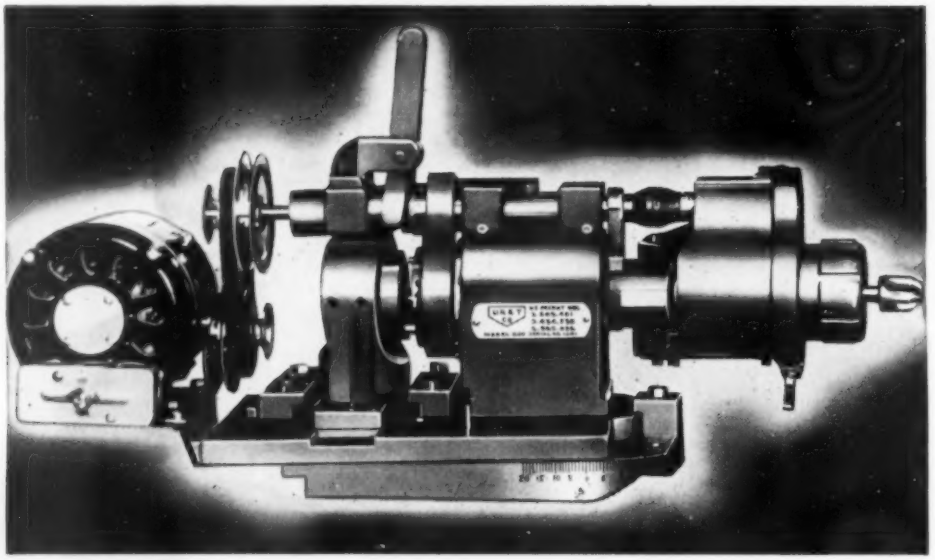
## THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

*Builders also of Production Milling, Vertical Turning, Automatic and Special Machines*

# *Precision* CIRCULARITY GRINDING ATTACHMENT



Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

The Detroit Reamer & Tool Company Model 500 Circularity Grinding Attachment shown above is faster, easier to handle, has positive control, greater adaptability, rugged construction, and is engineered and precision built to provide the finest in precision work. Therefore, it will be of invaluable assistance to anyone whose tooling standards must meet modern production requirements.

*You Can Grind Tools Like These on a* **DETROIT REAMER CIRCULARITY GRINDING ATTACHMENT**

# *Special Cutting Tools of* DEPENDABLE QUALITY

The Detroit Reamer & Tool Co. Plant is equipped with the finest in modern machinery and inspection facilities to provide you with the ultimate in precision tools. Our Engineering and production personnel with 35 years of empirical knowledge behind them are completely qualified to expertly handle your tool needs. For dependable cutting tools—specify Detroit Reamer & Tool Co.

## DETROIT REAMER & TOOL CO.

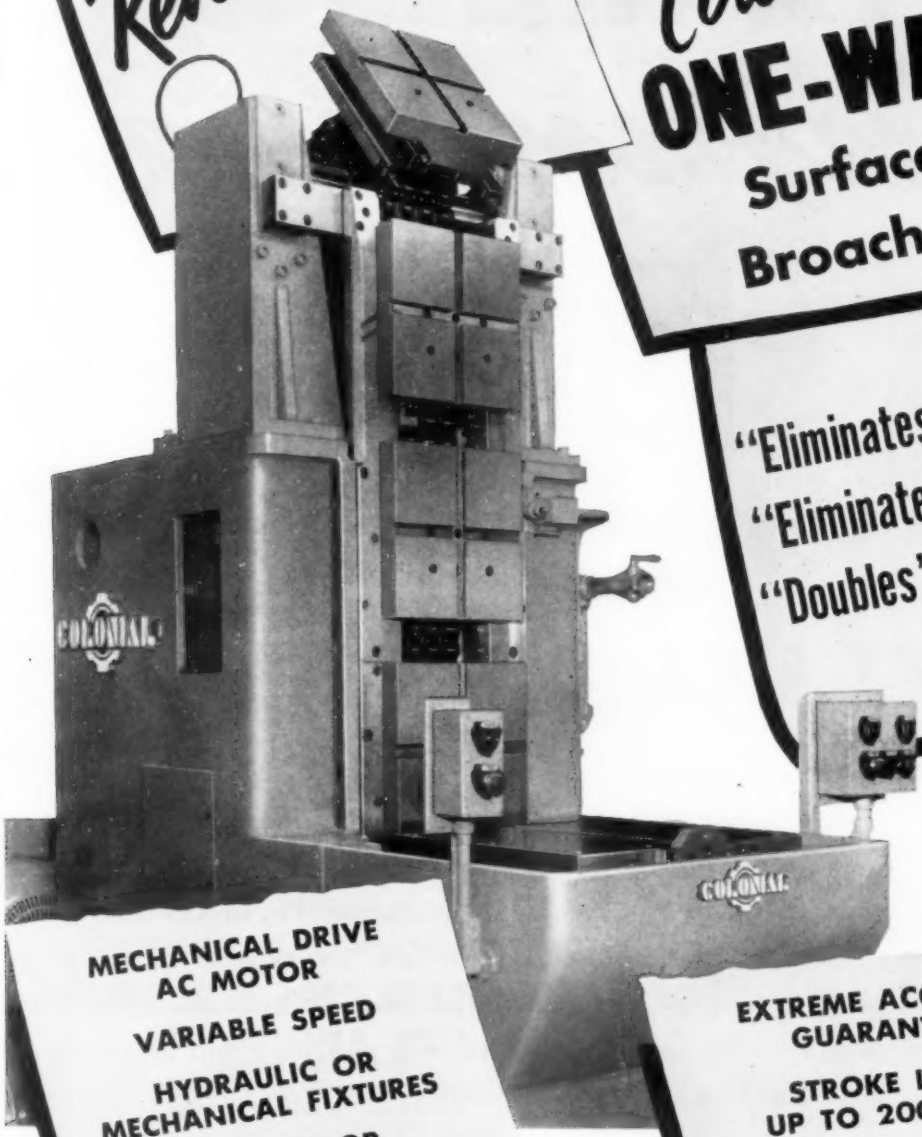
**2830 E. SEVEN MILE ROAD • DETROIT 34, MICH.**

D R & T COMPANY

# New! Revolutionary!

## Colonial ONE-WAY Surface Broacher

THE MACHINE TOOL SHOW
CHICAGO, ILL.
BOOTH 1112




"Eliminates" Return-Stroke
"Eliminates" End of Stroke
"Doubles" Length of Stroke

For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55. See it in operation at the Machine Tool Show.

MECHANICAL DRIVE AC MOTOR
VARIABLE SPEED
HYDRAULIC OR MECHANICAL FIXTURES
CARBIDE OR HSS BROACHES
NO PIT REQUIRED FOR LOW CEILING
LONGER TOOL LIFE

EXTREME ACCURACY GUARANTEED
STROKE LENGTH UP TO 200 INCHES
SPEEDS UP TO 50 FEET/MIN.
ONE LONG STROKE— ONE PART OR MULTIPLE SHORT STROKES ON MULTIPLE PARTS
CONTINUOUS OPERATION

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

*UNIFIED BROACHING is the key to successful broaching*

# WALES

## *announces a*

# FREE COST REDUCTION ANALYSIS

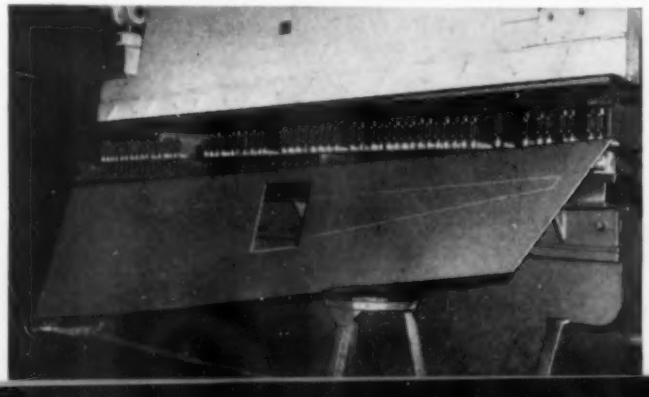
## FOR SHEET METAL FABRICATORS

This free service includes a complete analysis of your sheet metal fabricating operations by Wales competent and experienced engineers. By analyzing your present or future parts production, Wales engineers provide you with an evaluation study of your present costs compared with Wales methods and tooling.

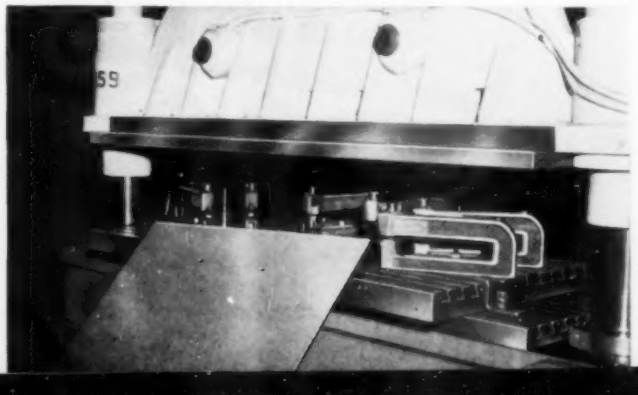
The astounding savings illustrated and described below, from one of many plants in the United States and Canada where the Wales Application Engineers have gone into operations, are typical of the huge savings made possible by Wales Production Method of hole punching and notching.

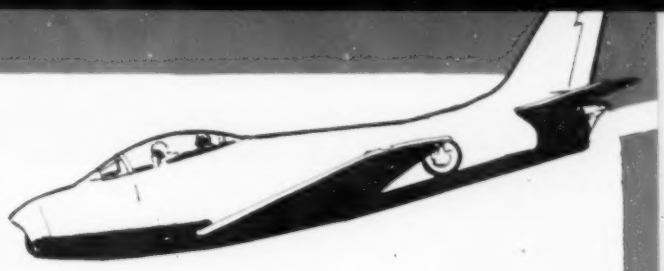
**NO OBLIGATION, OF COURSE!**

Typical of the many setups of the independent self-contained Wales Type "C" Hole Punching Units in a press brake at Canadair which produced in one year **SAVINGS OF APPROXIMATELY 46,000 HOURS.**



One of the many setups of Wales Type "BL" Hole Punching Units which are used and reused in unlimited hole patterns at Canadair producing in one year **SAVINGS OF APPROXIMATELY 12,000 HOURS.**

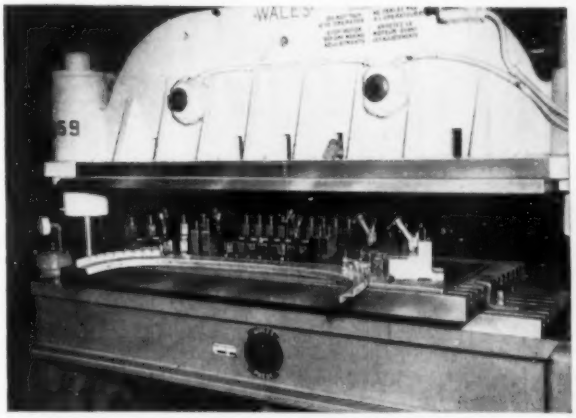




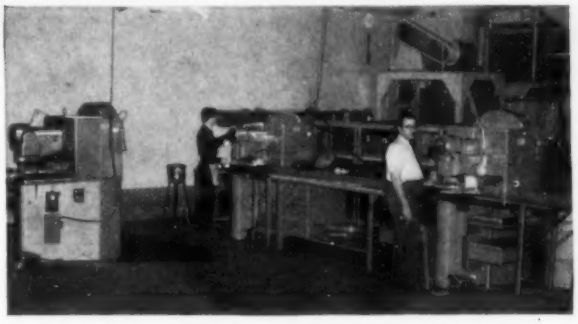
# What WALES Metal Working Equipment has done for Canadair OF MONTREAL, LIMITED

In the "Wales Department", as this section of the Canadair plant is commonly called, where these time studies, savings and photographs were made is a very efficient and cost-conscious department which, due to continuous efforts, have improved on cost savings submitted in the original Wales analysis. Actual operations, after the purchase of the Wales tooling and equipment, showed the survey figures on the conservative side.

Production savings produced by Wales tooling and equipment made the initial purchase costs a relatively small item.



A setup of Wales "H" Hole Punching Units in a Wales Twin Column Press for horizontal punching of flanges at Canadair which produced SAVINGS OF APPROXIMATELY 4,000 HOURS.



Three Wales Fabricators with "Quick Change" punches and dies which provide unusual time-saving and money-saving advantages at Canadair.

## HOW TO PUT THE WALES APPLICATION ENGINEERS TO WORK FOR YOU

Wales Application Engineers stand ready to make a complete evaluation of your sheet metal operations. Just call or write TODAY for an appointment at your convenience.

**WALES-STRIPPIT CORPORATION**

George F. Wales, *Chairman*

593 **Payne Avenue, North Tonawanda, N. Y.**

*(Between Buffalo and Niagara Falls)*

*Specialists in Punching and Notching Equipment*

Stocking bins and setup table for Wales Units at Canadair. Note setups are made outside the press and when placed in press are ready to operate with the first stroke of the ram.

Three setups of Wales Units in a press brake punching three different parts at the same time reducing press time by two-thirds. Note nothing is attached to press ram. Punches and dies are automatically aligned by self-contained Wales Units.

*Now...*

# MORSE

*Adds*

## to give you the Most Complete Line of Cutting Tools ever offered under one name!

Now, nobody *but nobody* has a cutting tool line to match Morse in completeness . . . in productive capacity . . . in distribution . . . in engineering service . . . and in the ability to recommend without bias the best cutting tool for every job in your plant, *regardless of* tool requirements!!

This complete new line of Morse Tungsten Carbide Tools . . . both tipped and solid . . . conforms to Morse standards of quality and precision and is backed by years of experience in Carbide tooling. And, it will be available from your only source of Morse-cost-cutting tools . . . your Morse-Franchised Distributor.

So call him *now* . . . get the whole story in detail. It's the most interesting news that anyone in industry has heard since Stephen Morse invented the twist drill!

**MORSE TWIST DRILL & MACHINE COMPANY**
**NEW BEDFORD, MASSACHUSETTS**
*(Division of VAN NORMAN CO.)*
*Warehouses in New York, Chicago, Detroit, Dallas, San Francisco*

# CARBIDE TOOLS

(TIPPED AND SOLID)

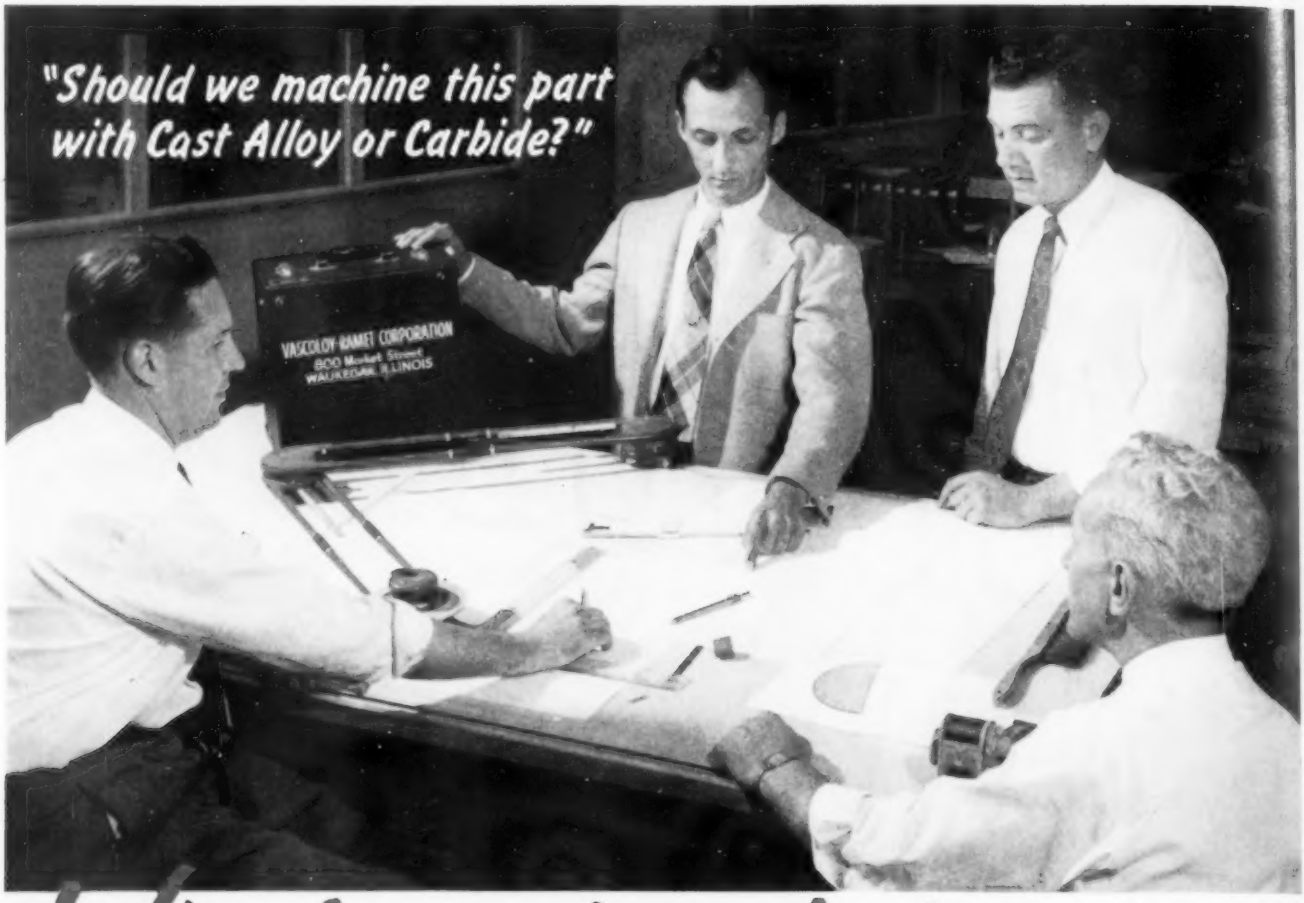
*Now...*

MORSE

*means*

**"THE MOST"**

*in Cutting Tools*


"Should we machine this part with Cast Alloy or Carbide?"
VASCOLOY-RAMET CORPORATION
800 Market Street
WAUKEGAN, ILLINOIS

# Which tool is better...

**Your V-R representative can assist you in solving this problem**

## because ONLY V-R MAKES BOTH TANTUNG® (Cast Alloy) AND CARBIDE

**TANTUNG® Cast Alloy tools bridge the gap in cutting speeds between high speed steel and carbide. TANTUNG® works best at high speeds and heavy loads. Its high transverse rupture strength resists breakage and permits use of greater positive rake angles.**

V-R makes the most complete line of standard single point cutting tools in America. Because of this, V-R offers you a complete cutting tool service from one dependable source. Your V-R representative will give you unbiased assistance in proper tool selection because only V-R makes *both* cemented carbides and TANTUNG. Ask your V-R representative for assistance. He is well qualified to serve you. Write for a free V-R Surface Speed Table and Tool Selector chart that shows feeds and speeds for TANTUNG and carbide.

**Visit the V-R Display Booths 246 and 247, Product Engineering Show, Chicago, September 6-16.**

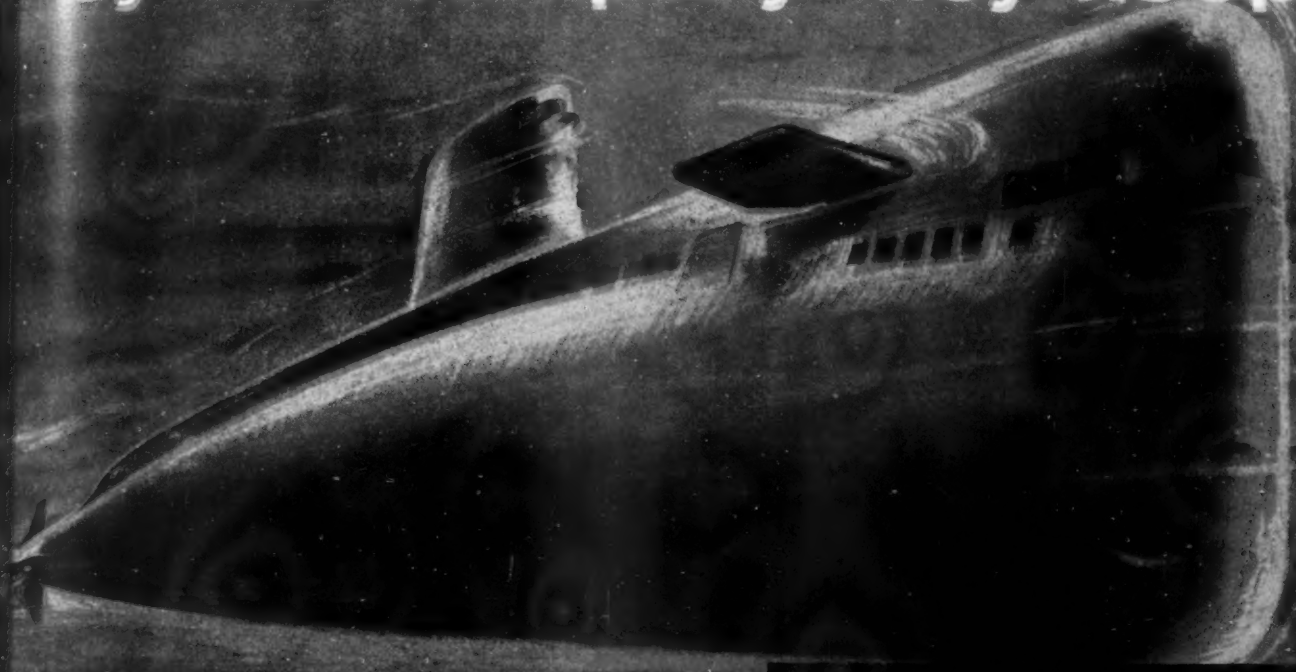
**Vascoloy-Ramet CORPORATION**

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

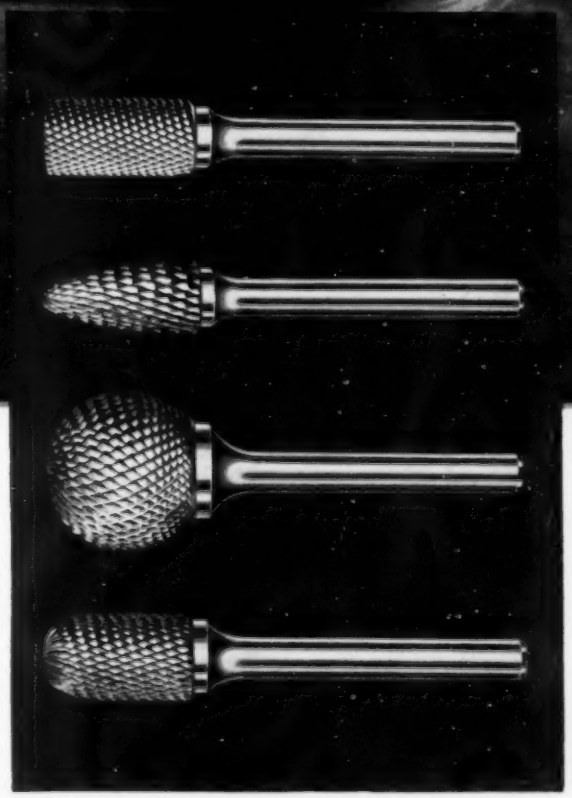
MANUFACTURERS OF CEMENTED CARBIDES • CARBIDE TOOLS AND BLANKS • TOOLHOLDERS AND INSERTS • TANTUNG TOOLS • DIES • MINING TOOLS • INVESTMENT CASTINGS

834 MARKET STREET • WAUKEGAN, ILLINOIS

# KNOWN
## by the company they keep



# PRATT & WHITNEY
# KELLERFLEX
## CARBIDE BURS



Able to cruise around the world at comparatively high speeds without surfacing, the atomic-powered submarine, USS Nautilus, is a giant stride into the future by American science and industry.

Throughout construction of this most advanced of all underseas craft by Electric Boat Division of General Dynamics Corp., P&W Kellerflex Burs — representing the ultimate advances in bur technology — were used exclusively. And aboard the Nautilus — where each part is weighed to the ounce and only the most essential equipment is carried — it is also significant that P&W Kellerflex Burs are included in the tool kits.

Yes, wherever only the finest will do, you'll find Pratt & Whitney Kellerflex Carbide Burs. For complete information, write on your Company letterhead for Circular No. 564.

**SEE THEM AT BOOTH 1219**

THE MACHINE TOOL SHOW CHICAGO, ILL.

**PRATT & WHITNEY**

DIVISION NILES-BEMENT-POND COMPANY

**WEST HARTFORD 1, CONNECTICUT, U.S.A.**

**DIRECT FACTORY REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE COUNTRY**

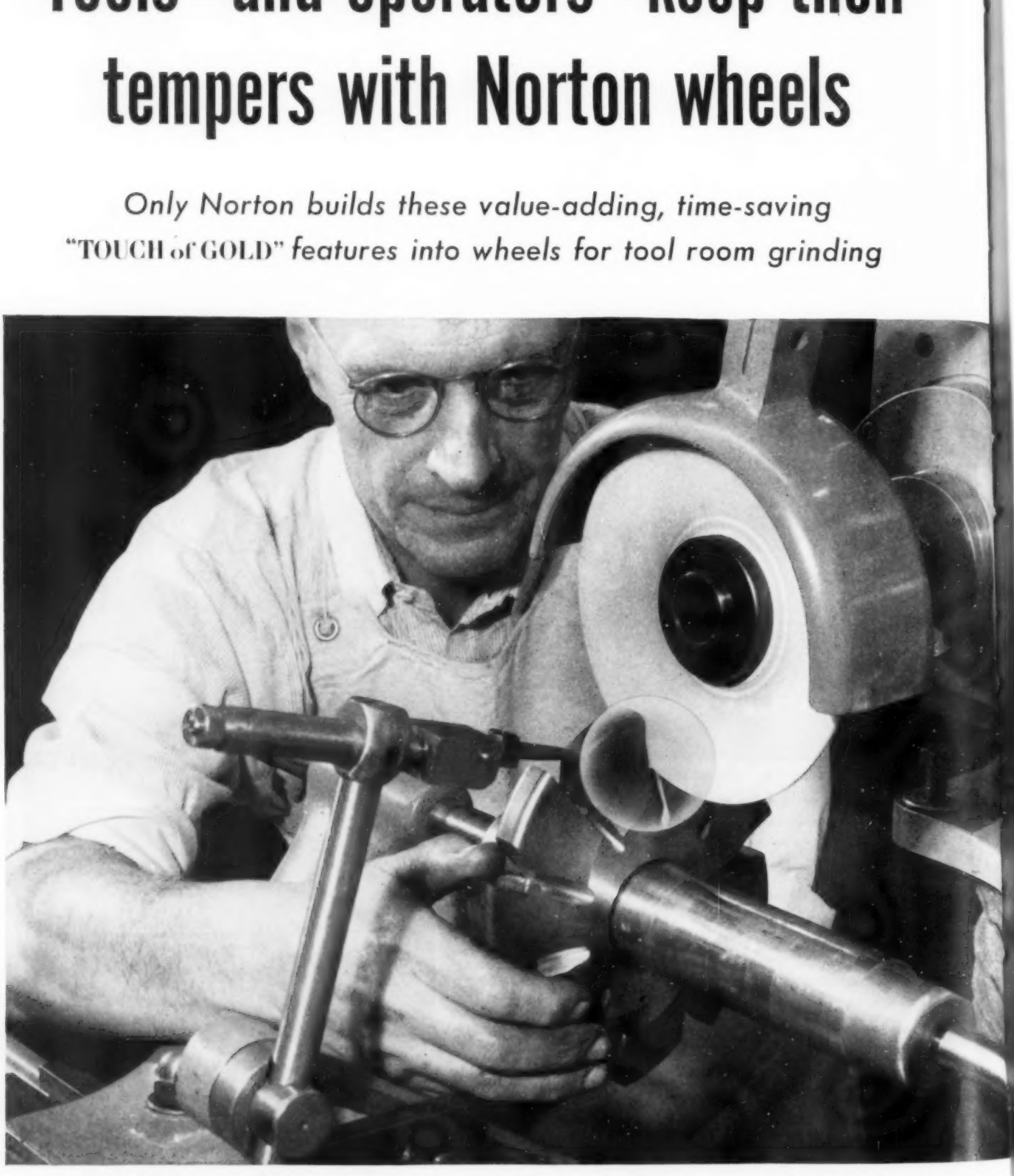
FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • CUTTING TOOLS • GAGES

SINCE 1860

# Tools – and operators – keep their tempers with Norton wheels

*Only Norton builds these value-adding, time-saving "TOUCH of GOLD" features into wheels for tool room grinding*



**All teeth stay the same height** when you sharpen milling cutters with long wearing, free cutting Norton G Bond wheels that hold size all the way round. 32 ALUNDUM® abrasive permits top grinding speed without burning. The machine is a Norton No. 20 Cutter and Tool Grinder.

No other wheels for tool room grinding are made the way Norton makes them. Exclusive precision processing gives them unusual advantages, including controlled uniformity and built-in balance, that reduce vibration and assure smoother running wheels.

### Plus The Famous G Bond

Also, you can get these wheels in the most efficient vitrified bond ever produced — the Norton G Bond, developed especially for precision-grinding the hardest tool steels. Holding the abrasive particles just long enough for maximum cutting action, G Bond wheels: *cut freer, cooler, faster . . . do more work per wheel and cover a wider range of jobs . . . hold corners better, dress easier and grind more pieces per dressing.*

And for rapid stock removal, with especially cool cutting action, Norton 32 ALUNDUM* abrasive is outstandingly popular. With all G Bond wheels you can take heavier cuts in expensive, heat-sensitive steels without drawing temper. They'll reduce tool spoilage, give you closer tolerances and smoother finishes, with fewer wheel changes and machine adjustments — additional "Touch of Gold" benefits that mean better performing tools and better, lower-cost tool room grinding than you ever got before.

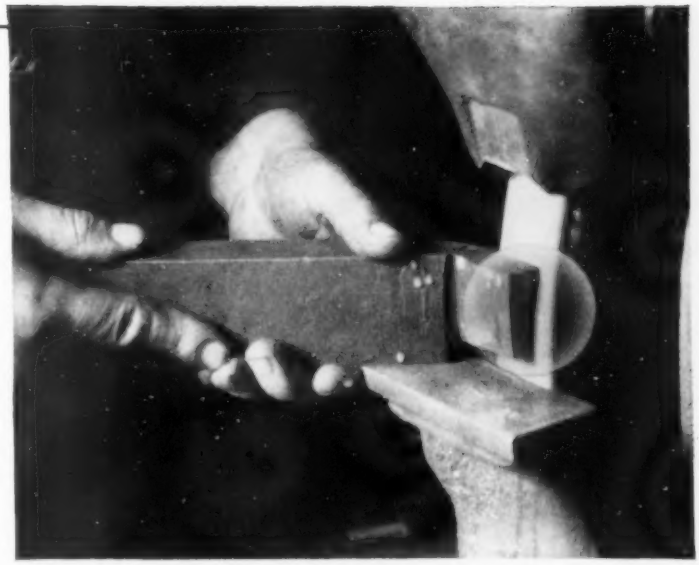
### For Your Carbide Grinding

Norton diamond wheels, carbide grinding's recognized "Crown Jewels", are products of Norton's long leadership in diamond wheel development. Made in all required bond types, their accurate cutting action and extra long service life bring you top savings in every single-point and multi-tooth carbide grinding application. Also available are CRYSTOLON* wheels — green and gray — with the cost-cutting K Bond.

### Your Norton Distributor

will gladly recommend the right Norton wheels for your tool room requirements. Or write direct. And remember: only Norton brings you such long experience in both grinding wheels and grinding machines — your assurance of the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



**Offhand grinding a planer tool** is a fast, cool operation with Norton G Bond wheels. ALUNDUM* abrasive permits top grinding speed without burning.

**NORTON GENERAL PURPOSE WHEELS**

For your ordinary bench or floor stand grinding, use these out-of-the-ordinary wheels. Available in abrasive-and-bond combinations for economical, trouble-free performance throughout the entire range of routine grinding jobs. Chances are that any tool wheel or general purpose wheel you require is carried in stock.

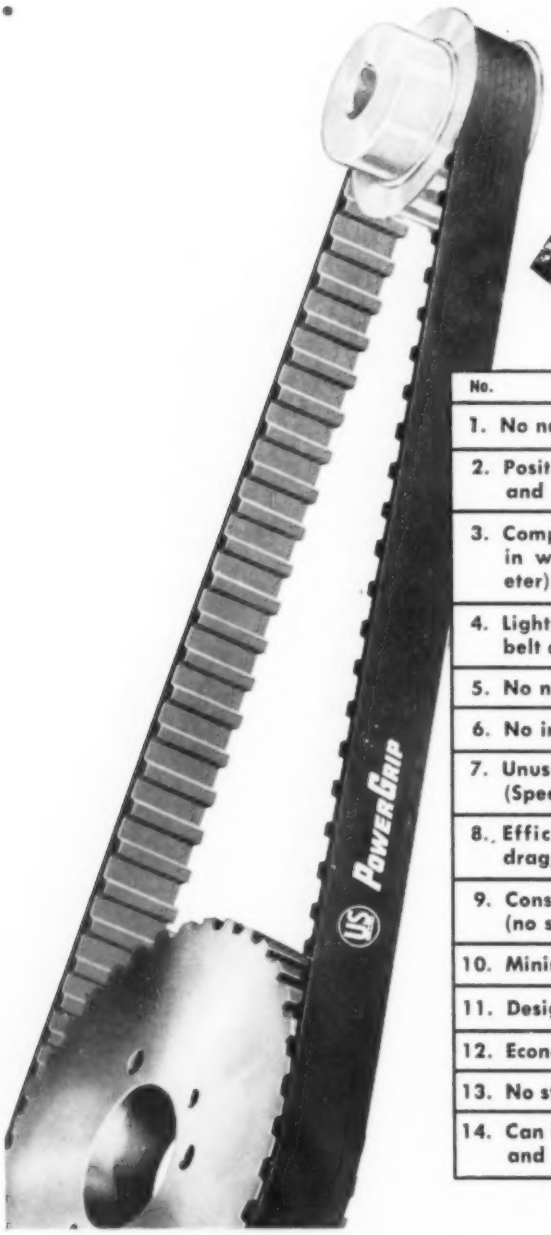
W-1660

NORTON

*Making better products... to make your products better*

**and its BEHR-MANNING division**

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes




# "√" in your transmission belt needs

| No. Advantages | PowerGrip "Timing" Belt | Chain | Gear | V-Belts | Flat Belts |
|---|---|---|---|---|---|
| 1. No need for lubrication | √ | | | | |
| 2. Positive elimination of slip and creep | √ | | | | |
| 3. Completely compact (Both in width and pulley diameter) | √ | | | | |
| 4. Lightweight (Heavy duty belt only 0.1 lb./ft./in.) | √ | | | | |
| 5. No noise or vibration | √ | | | | |
| 6. No initial tension | √ | | | | |
| 7. Unusual speed range (Speeds up to 12,000 FPM) | √ | | | | |
| 8. Efficient (Elim. heat, lube drag, high bearing loads) | √ | | | | |
| 9. Constant angular velocity (no speed fluctuation) | √ | | | | |
| 10. Minimum backlash | √ | | | | |
| 11. Design flexibility | √ | | | | |
| 12. Economical | √ | | | | |
| 13. No stretch | √ | | | | |
| 14. Can it be completely housed and forgotten? | √ | | | | |

**Note that the U. S. PowerGrip "Timing" Belt takes a "√" after every advantage**

While every type of drive has certain advantages, *no* type of power transmission possesses *so many* advantages as the U.S. PowerGrip "Timing" Belt drive. For example, *it is the only positive drive that never needs lubrication.*

THE LIST OF USES GROWS DAY BY DAY! Power production machinery in every field is made more efficient, volume of production increased, and maintenance costs lowered with this amazing belt. The list of OEM applications grows too numerous to mention. U.S. PowerGrip has streamlined hundreds of products... made them sell above competition. Some equipment would not be in existence at all, if it weren't for this great belt.

Immediate delivery of stock drives with ratios up to 12 to 1 is obtainable from any of United States Rubber Company's selected distributors or any of the 27 "U.S." District Sales Offices, or the address below.

*Send for free illustrated manual, complete with standard drive tables.*

**See the U. S. PowerGrip "Timing" Belt in Booth 102 at the Production Engineering Show.**

US RUBBER

**UNITED STATES RUBBER COMPANY**

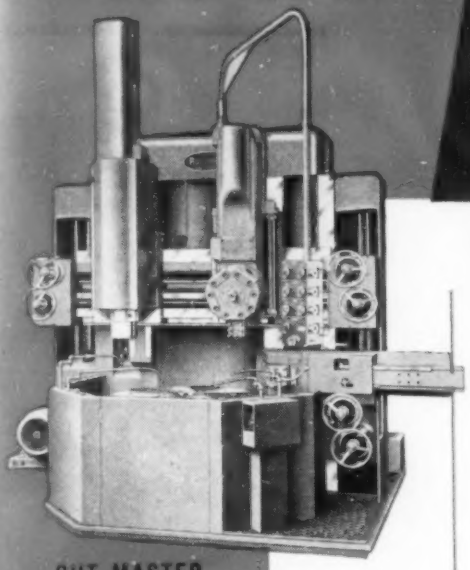
**MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.**

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes
Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

# .....you're Invited to.....

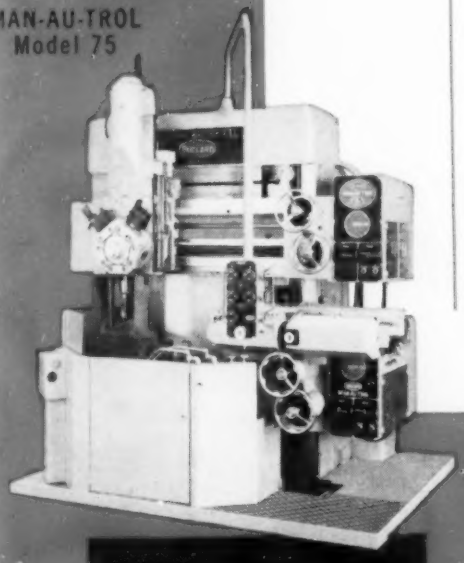
## BOOTH 1213

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

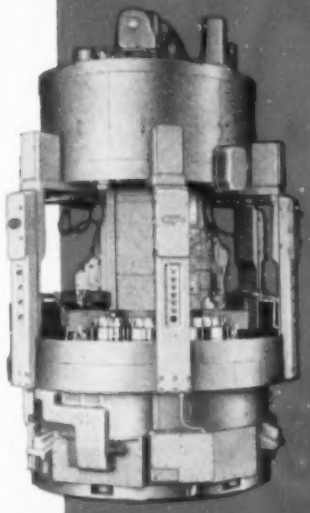


CUT MASTER
V.T.L.
Model 75

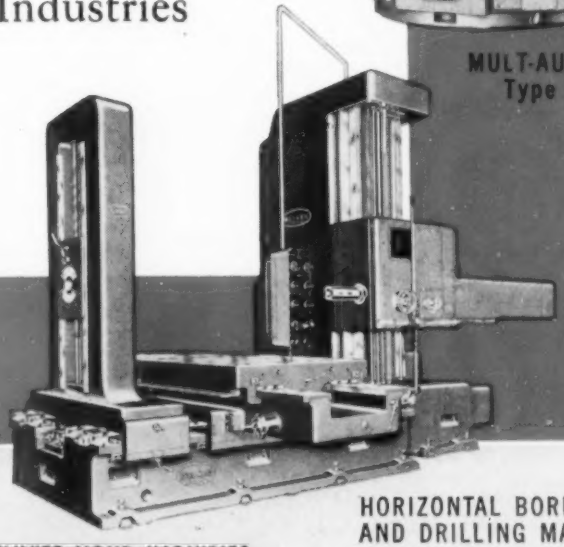
MAN-AU-TROL
Model 75



You will see
the most
Modern Line
of
Machine Tools
available to the
Metal Working
Industries



MULT-AU-MATIC
Type "L"



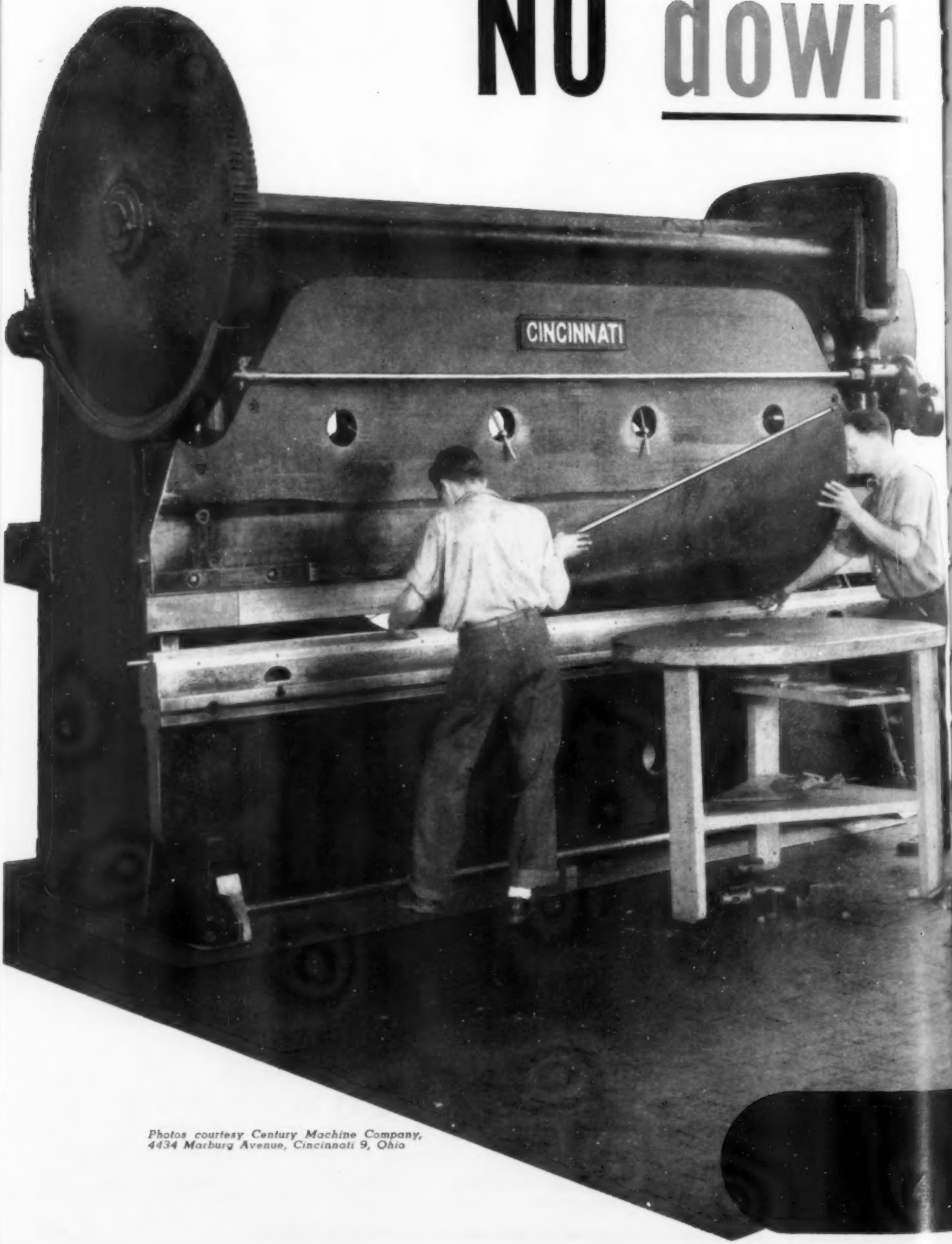
HORIZONTAL BORING, MILLING
AND DRILLING MACHINE
Model 75

SEVENTY FIFTH
BULLARD
ANNIVERSARY

WE INVITE YOUR INQUIRIES
CALL OR WRITE YOUR NEAREST
BULLARD SALES OFFICE, DISTRIBUTOR OR . . .

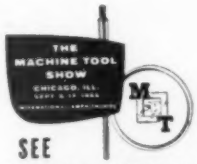
THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

# NO down




*Photos courtesy Century Machine Company, 4434 Marburg Avenue, Cincinnati 9, Ohio*

# time in 16 years...

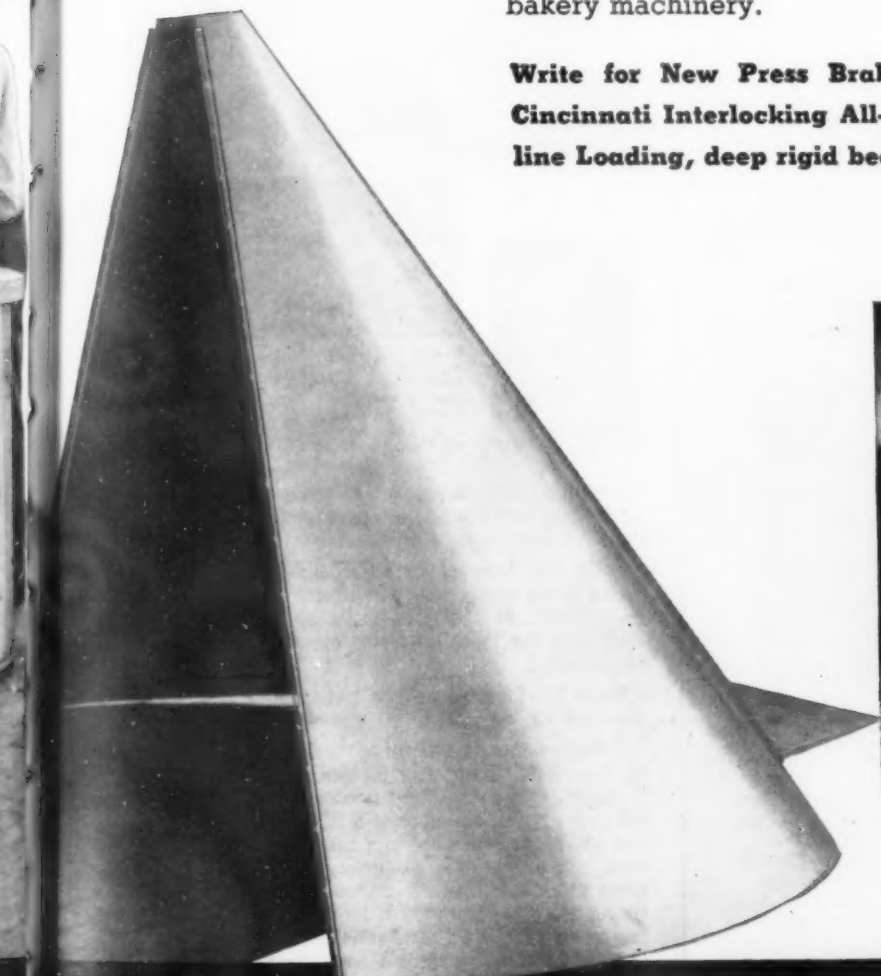


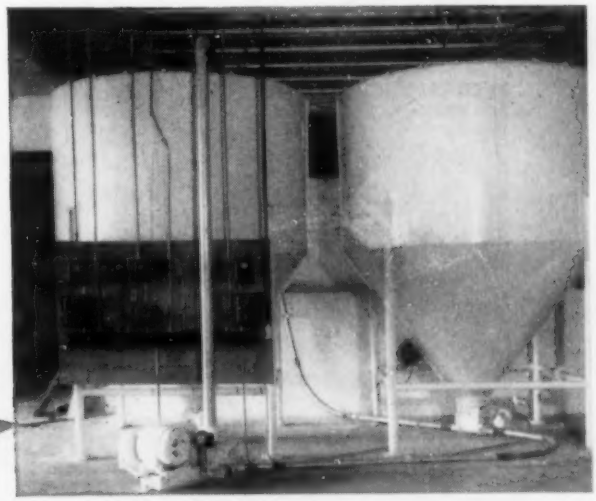

SEE
CINCINNATI
SHAPERS, SHEARS,
PRESS BRAKES
BOOTH 1105

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

**Write for New Press Brake Catalog B-4 describing Cincinnati Interlocking All-Steel construction, Center-line Loading, deep rigid beds and rams.**





● Flour Storage Bins—each 1000 lbs. capacity

## THE CINCINNATI SHAPER CO.

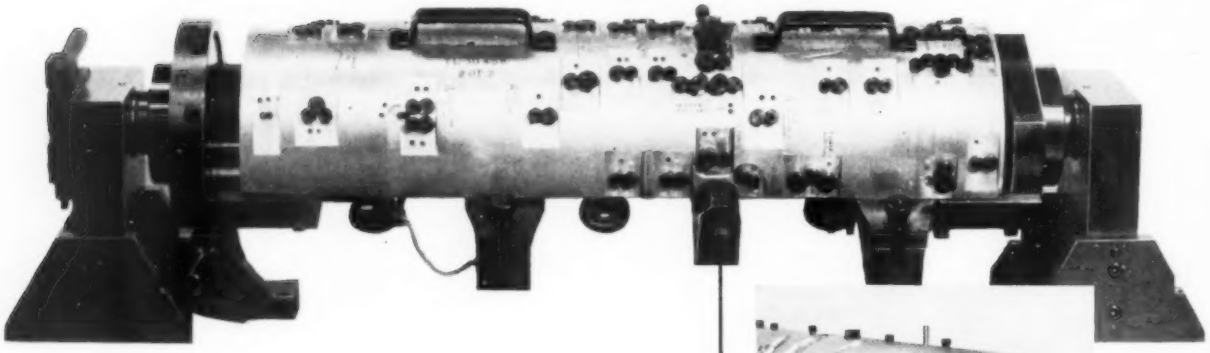
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

One of a series
MODERN TOOLING TECHNIQUES

# UP TO ±.0005" BORING TOLERANCE HELD IN 140-HOLE PATTERN

## Lack of internal stress and strain in Pioneer 921-T eliminates distortion tendencies in Assembly Drill Jig



*Write for 921-T Catalog*

shows complete range of applications, important mechanical properties, stock sizes and special cast sizes.

by Carl T. Weitzel, President, Mechanical Specialties Co. Member, So. Calif., & Nat'l Tool & Die Mfrs. Assoc.

The accompanying photos show a complicated drill jig 42" long with a 140-hole pattern fabricated for Hughes Aircraft Co. by Mechanical Specialties Co.

This jig was designed for ultra precision work. Boring of the drill bushing pattern had to be held to ±.0005". Absolutely no distortion or movement after the finish machining operation could be permitted.

Pioneer 921-T cast aluminum tooling plate was specified for the job.

Like Hughes Aircraft, many of our customers specify Pioneer 921-T wherever dimensional stability is essential. Pioneer 921-T's freedom from internal stress and strain provides a tooling material that can be depended upon for consistency, flatness, and exceptional parallelism to maintain close tolerances. Easy machinability and light weight are other factors that influence our customers to specify Pioneer. (This same drill jig in steel would weigh about 3 times as much.)

Mechanical Specialties Co. has been producing quality tooling since 1938. From our experience we can recommend Pioneer 921-T as an outstanding tooling material.

**PIONEER**

***Formula* 921-T**

cast aluminum tooling plates and bars for use in jigs, dies, fixtures and special machines.

**WHERE TO BUY 921-T:**

**PIONEER TOOL ENGINEERING, INC.**
*1601 E. El Segundo Blvd., El Segundo, Calif.*

**Pioneer Sales Engineering**
2233 Inkster Rd.
Inkster, Michigan

**Meier Brass & Aluminum Co.**
1471 E. Nine Mile Rd.
Hazel Park, Michigan

**Towne Aluminum Supply Co.**
1410 So. Akard Street
Dallas 2, Texas

**Edgcomb Steel & Aluminum**
460 Hillside Avenue
Hillside, New Jersey

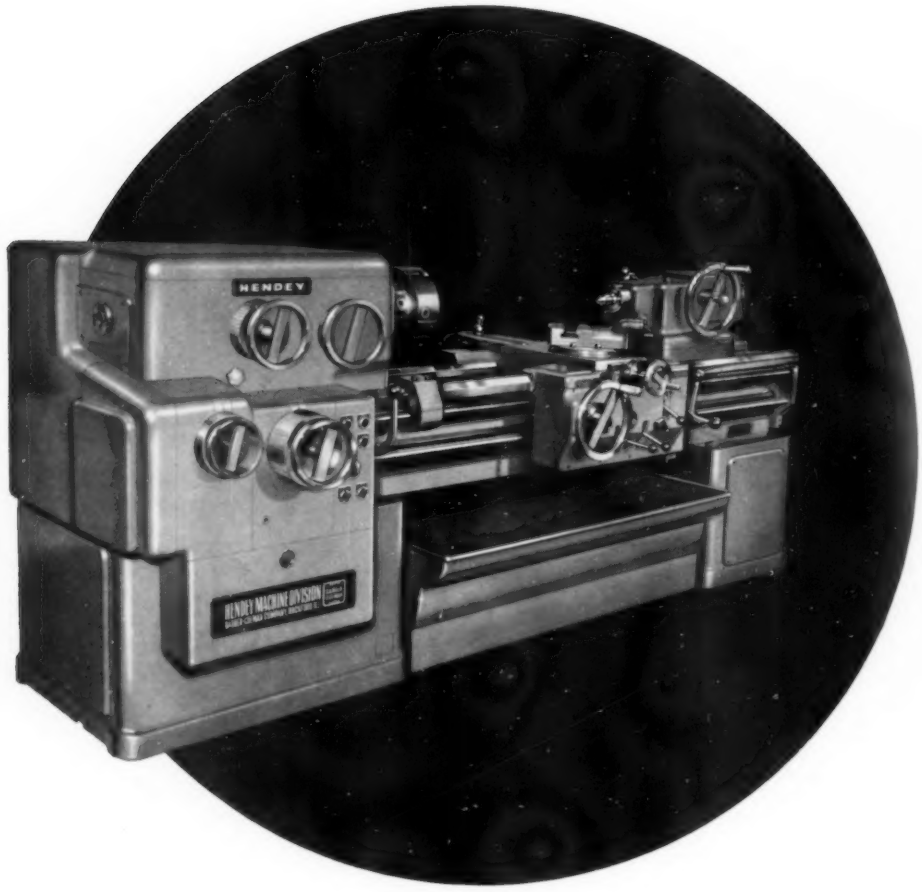
**Industrial Metals**
*General Office*
410 Southwest Blvd.
Kansas City, Missouri
*Warehouses in:*
St. Louis, Missouri
Wichita, Kansas

**Kasle Steel Corporation**
*General Office*
4343 Wyoming
Detroit, Michigan
*Warehouses in:*
Grand Rapids, Michigan
Elkhart, Indiana
Cleveland, Ohio

**Southern States Iron Roofing Co.**
*General Office*
Stiles Avenue and Louisville Road
Savannah, Georgia
*Warehouses in:*
Atlanta, Georgia
Birmingham, Alabama
Louisville, Kentucky
Memphis, Tennessee
Miami, Florida
Nashville, Tennessee
Raleigh, North Carolina
Richmond, Virginia

what's
new in
production
lathes?

# *two new Hendey lathes...*

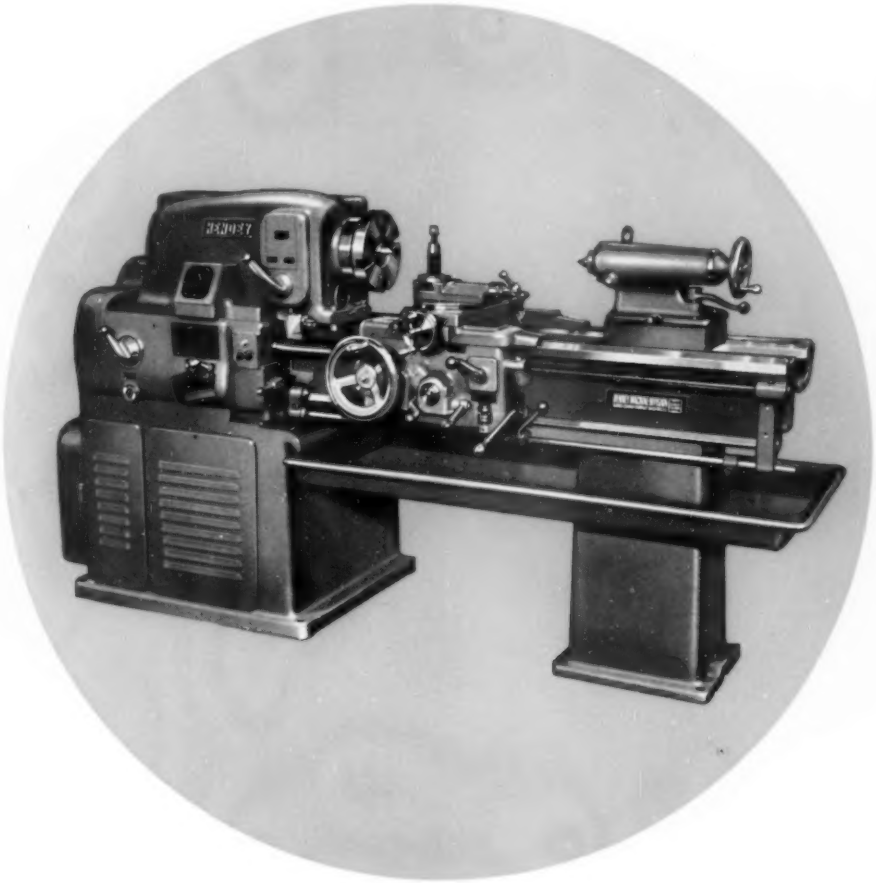



**32-Speed Geared Head Lathe**

This completely new lathe has a 32-speed headstock with the top eight speeds obtained through a belt drive to assure smooth finish on the work. This machine is equipped with a 15 HP motor, and spindle speeds up to 1500 RPM are available. It is designed to accommodate a 20 HP motor for spindle speeds to 2000 RPM. It can be furnished in 13", 16" and 20" sizes. Exclusive induction hardened and precision ground bed ways provide maximum accuracy and long life. Other features include 66 thread and feed changes, an independent lead screw, automatic lubrication, high-speed reversing mechanism, precision automatic stops, and heavy-duty, two-speed tail stock.

See them in action in Booth No. 221

# *for greater accuracy and production*



These new modern lathes are Barber-Colman's answer to any questions concerning the future of the Hendey line. They are proof of the strides we have already made and indicate the continued progress which we guarantee in the future. For years Hendey has had a reputation for accuracy. Now, new machines and features provide even closer limits of accuracy and greater production. Electronic and magnetic amplifier drives, induction hardened and precision ground bed ways, and a 32-speed geared head-stock are only a few of the new features available on Hendey lathes. See these new machines in action to determine how they can fill your production requirements.

**No. 2E Precision Lathe**

The new No. 2E Hendey Lathe is a 14" general-purpose precision lathe equipped with "Selectronic" control of spindle speeds. The electronic unit provides closer control over cutting speeds and full torque at slow speeds. It is an exclusive Hendey feature and is custom built for this lathe. Speeds may be pre-set or changed while cutting, and they are infinitely variable from 15 RPM to 1500 RPM. Low speeds are available through back gears. The spindle starts, stops, and reverses with a single lever control. Other features include dynamic braking, automatic lubrication, precision spindle bearings, and hardened and ground bed ways.

*Hendey* **machine division**

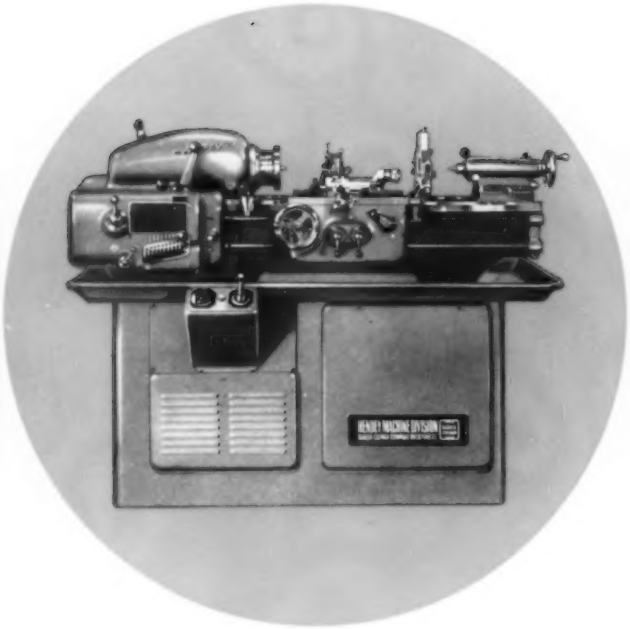
**BARBER-COLMAN COMPANY**

**115 LOOMIS ST., ROCKFORD, ILLINOIS**

BARBER COLMAN

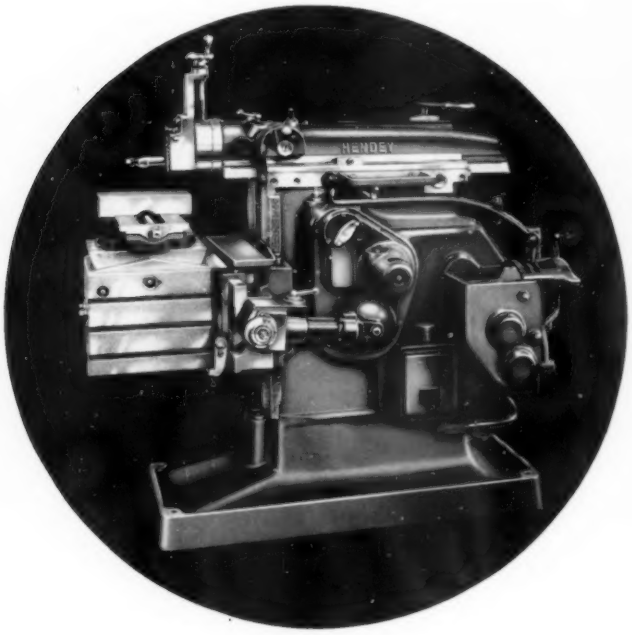
# see these Hendey tool room machines

These Hendey machines are high-speed machines designed for maximum efficiency on toolroom or production work. Many new features have been added to increase their accuracy, versatility and ease of operation. We invite you to see them in action at the Machine Tool Show.



**9" Tool and Gage-Makers' Lathe**

Hendey 9" Tool and Gage-Makers' Lathe provides maximum precision and versatility for tool room and production use. It is available with magnetic amplifier drive for top turning efficiency. Spindle speeds range from 15 RPM to 3000 RPM with the lower speeds available through back gears. Other features include 10-1/4" swing and 24" center distance, 66 thread and feed changes, and an independent lead screw.




**12" Crank Shaper**

Hendey 12" Crank Shaper is a high-speed machine designed with maximum cutting power and flexibility in a wide range of work. Constructed especially for precision work, the machine is standard with universal table and vise for positioning the work to any angle. Full standard equipment also includes dual mechanical controls, automatic lubrication, quick-change swivel head and adjustable preloaded Timken bearings on the crank gear.

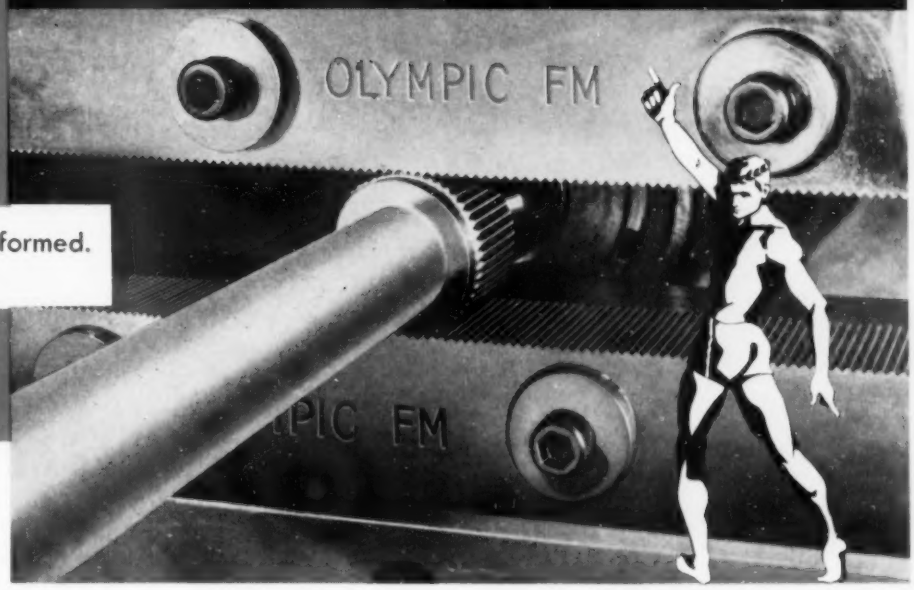
Hendey **machine division**

**BARBER-COLMAN COMPANY**

115 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

# Olympic FM
## DIE STEEL . . . used on
## Roto-Flo Spline Rollers




SAE 1040 splines being cold formed.
Photo courtesy Michigan Tool Co.

**Michigan Tool Co., Detroit, selected**

## Olympic FM for this severe cold forming application

On the new Roto-Flo Spline Rollers manufactured by the Michigan Tool Company, Latrobe's Olympic FM Die Steel has been specified for use in the cold forming racks shown above. This is a severe application involving heavy pressure to cold-form steel splines, serrations and similar shapes . . . an application that demands up to 150,000 production pieces before the racks are removed for regrinding.

Olympic FM . . . one of Latrobe's new free-machining high carbon-high chromium die steels . . . has proved extremely successful on long production runs of all types of tools and dies. In addition to long performance characteristics, Olympic FM yields a superior machined finish and easier machinability . . . factors resulting from the addition of alloy sulphides uniformly dispersed by the DESEGATIZED® process of manufacture.

**For improved machinability and long production runs, order Olympic FM . . . over 250 sizes are stocked in ten conveniently located warehouses. Your order will be handled promptly and courteously.**

BE SURE TO SEE THE
**ROTO-FLO** IN ACTION!
MACHINE TOOL SHOW
Chicago—Sept. 6 thru 17th

**LATROBE**
**STEEL COMPANY**
Main Office and plant
LATROBE, PENNSYLVANIA

Branch Offices and Warehouses in principal cities

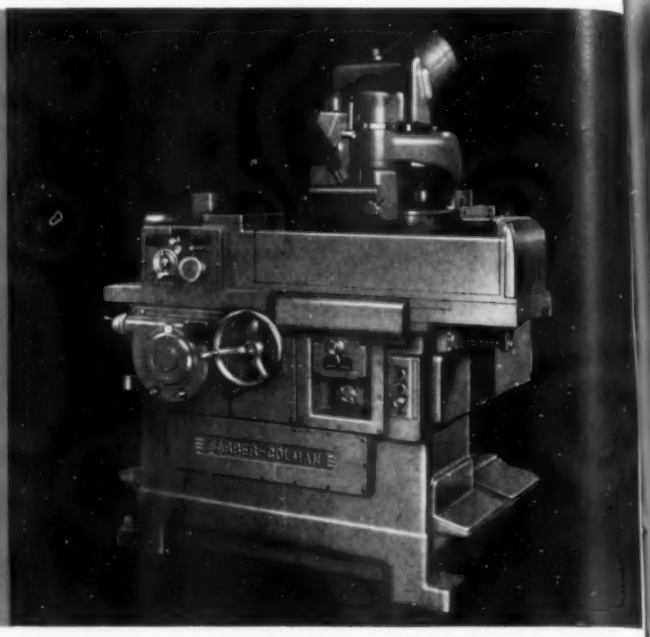
keep tool maintenance on a production basis with

# automatic

## NEW no. 6-5 sharpening machine

### A PRODUCTION MACHINE FOR PRECISION SHARPENING

- wet grinding for carbides
- adjustable stroke and table speed
- precision built-in wheel dresser
- automatic feed and index counting




The new No. 6-5 Hydraulic Sharpening Machine provides a production method for precision sharpening of hobs and form — relieved cutters. This is a precision machine which accurately controls spacing, rake angle, lead of flute and surface finish.

Wet grinding, which is provided as standard equipment on the No. 6-5, is essential for grinding carbide — tipped tools and also permits greater feed when sharpening high-speed steel tools. Setting up new jobs for completely automatic sharpening is accomplished rapidly and conveniently. The adjustable table stroke and variable table speed also contribute to the production efficiency of this machine.

For a demonstration of how to keep cutting tool maintenance on a production basis, see this machine in operation at the Machine Tool Show.

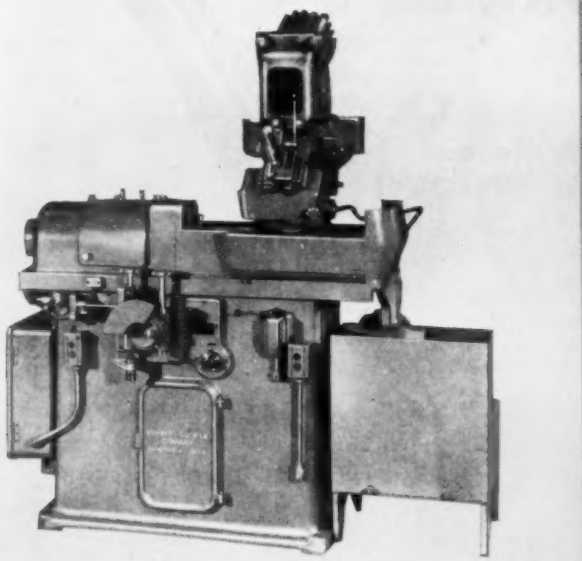
Visit us in Booth No. 1322

### Barber-Colman Sharpening Adaptable to All Hobs and Form-Relieved Cutters

Sharpening is one element of hob accuracy which must be maintained in order to cut correct gears. For high production sharpening or for small, job-lot sharpening, the most economical and most accurate method of sharpening hobs and form-relieved cutters is the Barber-Colman method. In addition to the No. 6-5, two other sharpening machines, the No. 4-4 and the No. 10-12, are built to cover a complete size range of work. Any hob or form-relieved cutter can be sharpened on one of these machines.

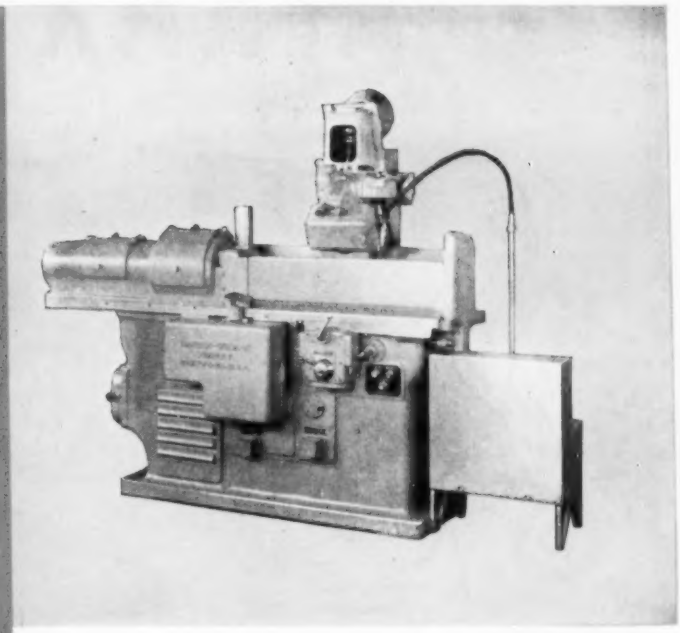
BUILDERS OF PRECISION GEA

# hob sharpening



## No. 4-4 Sharpening Machine

This is an automatic sharpening machine with fixed stroke, and built-in wheel dresser for work up to 4" diameter and 4" long. Wet grinding (shown) is optional as extra equipment. Positive mechanical control over all sharpening factors automatically produces uniformity and reduces sharpening time. Spacing, lead of flute and radialism are held within tolerances for any accuracy classification, including Class AA.



## No. 10-12 Sharpening Machine

This is an automatic sharpening machine with adjustable hydraulic stroke for work up to 10" diameter by 12" long. Wet grinding (shown) is optional as extra equipment and the machine has a precision built-in wheel dresser as standard equipment. Tolerances are easily held for any specific class of accuracy. Once the necessary set-up is made, sharpening proceeds automatically without further attention from the operator.

All Barber-Colman hobs and form-relieved cutters are sharpened on one of these three machines. Because of their accuracy and ease of operation, most competitive hob manufacturers also use them for sharpening hobs.

A Barber-Colman Sharpening Machine will do your sharpening cheaper, faster and more accurately than can be done by any other method. Come in and see us during the Machine Tool Show to determine how you can simplify your sharpening problems by adopting this modern precision method.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

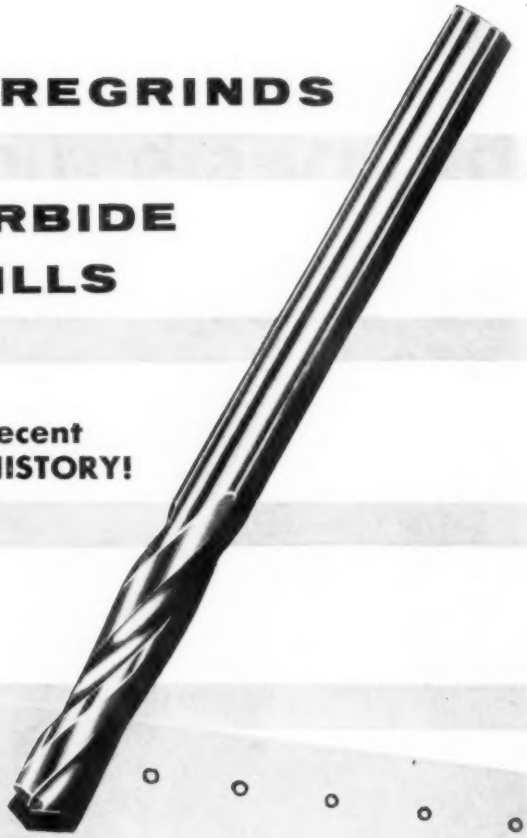
**Barber-Colman Company**

GENERAL OFFICES AND PLANT, 638 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

# 12 HOURS BETWEEN REGRINDS

## with ATRAX CARBIDE DRILLS



**A Recent CASE HISTORY!**

We helped solve a production problem for a customer who had been using HSS Tools. They had to drill a 7/32" diameter hole ½" in length, in steel on an automatic set-up. While the use of a HSS Drill needed re-sharpening every hour, ATRAX Carbide Drill at a speed of 3,450 R.P.M. and a feed of 1,003 revolutions lasted perfectly for 12 hours between regrinds.

"ATRAX Drills give us exceptional performance, save our operators' time and increase production" writes our customer.

Let ATRAX Engineers help solve your production problems with ATRAX Precision Ground-from-the-Solid Carbide Tools.

*It's New!* Complete 88-page catalog of ATRAX Carbide Tools, includes selection tables and recommended applications. Write today for your copy.

## THE ATRAX COMPANY

### NEWINGTON 11, CONNECTICUT

ATRAX Representatives and Distributors are located in principal cities throughout United States and Canada. Write us for our Representative's name in your area.

*Specify ATRAX Precision Ground-from-the-Solid Carbide Tools*

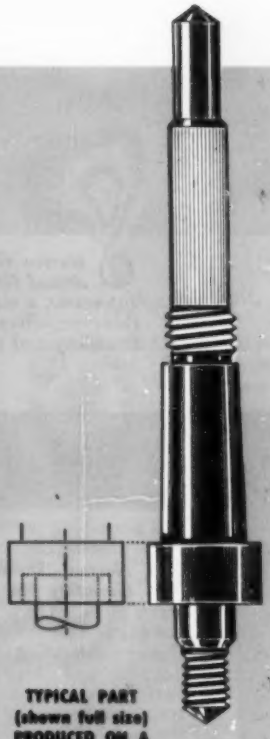
# PETERMANN

## AUTOMATICS

## *for close tolerances . . .*

**THIS NEWEST MEMBER OF THE *Petermann* FAMILY OFFERS NEW AND VALUABLE FEATURES SUCH AS:**

1. Six (6) radial tools (all independently controlled).
2. Hydraulic buffer for shortening the time of return stroke.
3. Accelerator which speeds up the cam shaft during "idle time"
4. Speed box change for both spindle and cam shaft.
5. Automatic lubricating system.



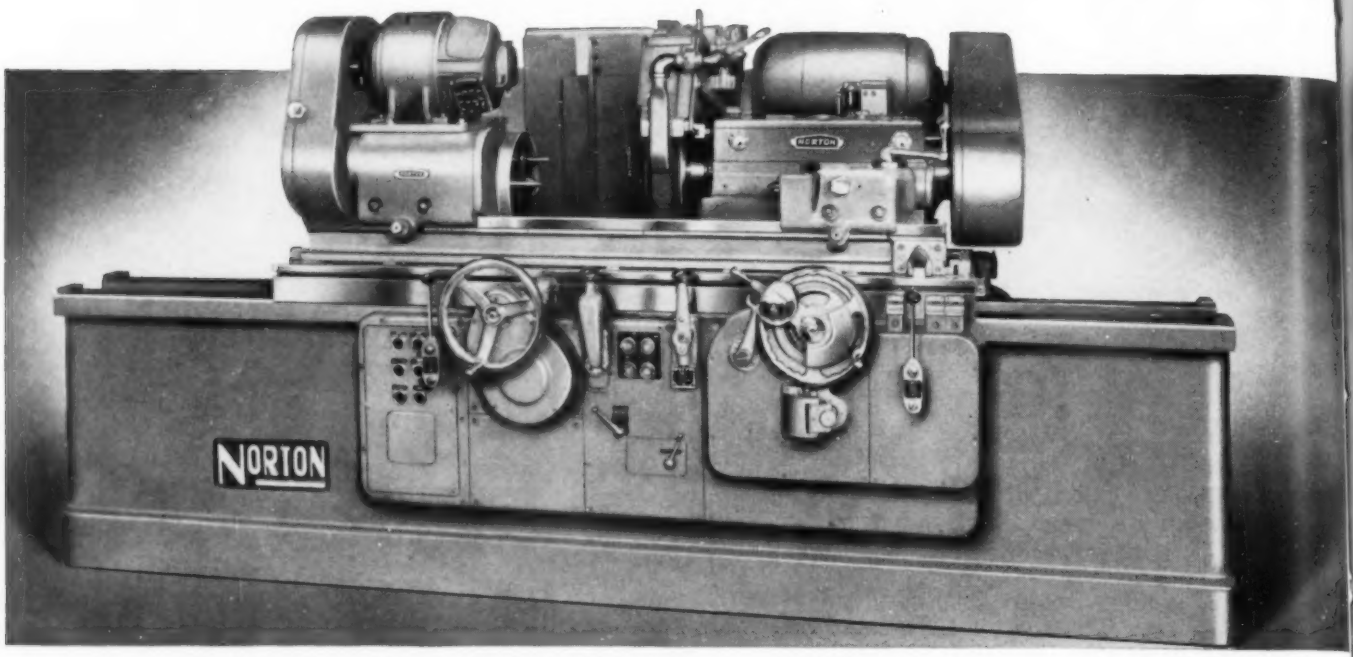
**TYPICAL PART (shown full size) PRODUCED ON A PETERMANN AUTOMATIC**

**Complete tooling service and parts in America**

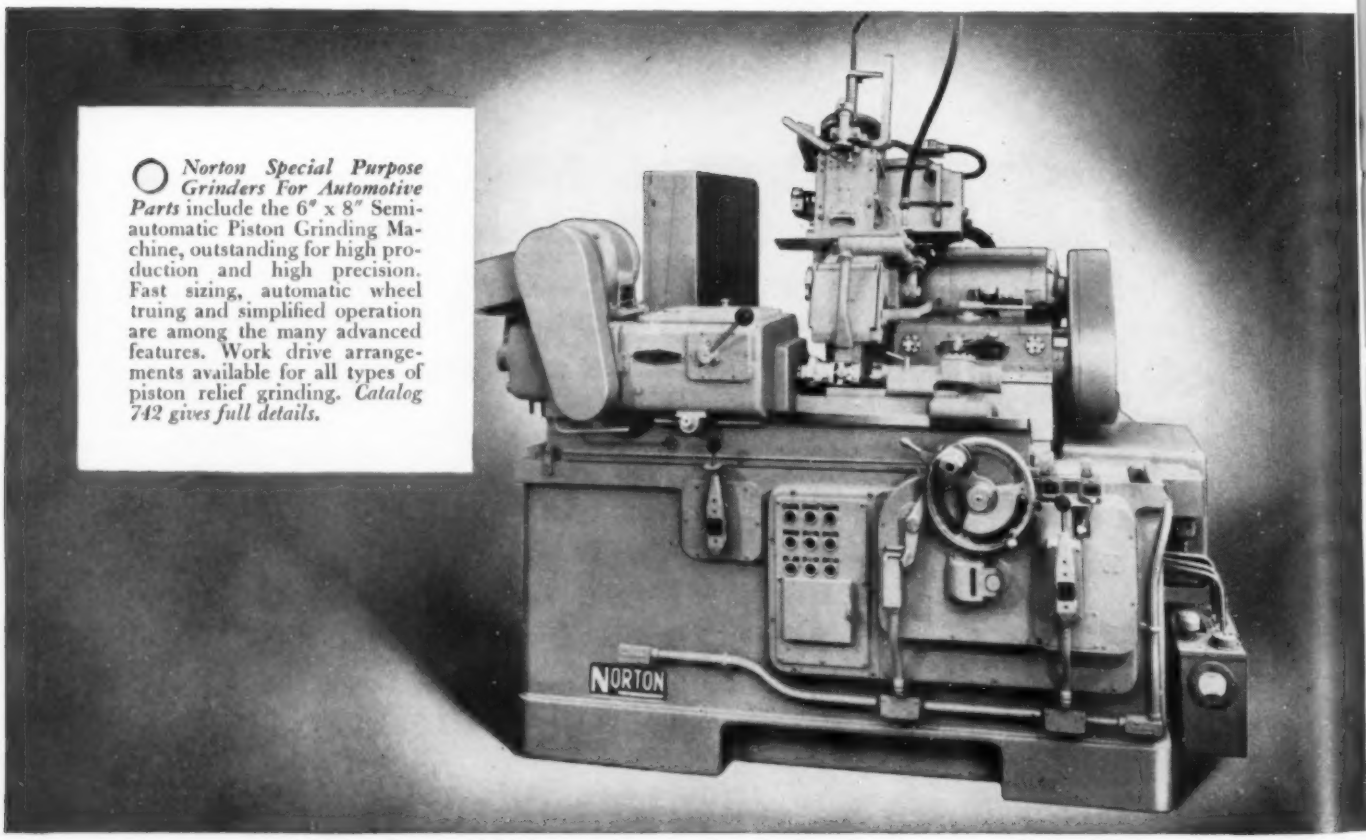
# RUSSELL, HOLBROOK & HENDERSON, INC.

**292 Madison Avenue, New York 17, N. Y.**

# 6 from the world's most




○ *Norton General Purpose Production Type Cylindrical Grinders.* The 10″ x 36″ Type CTU Semi-automatic, a top performer among grinding machines of this type, offers a unique combination of speed, accuracy, flexibility and sturdiness. One-lever control of the automatic grinding cycle reduces operator's duties to loading and unloading. Production line and job shop users report Norton 10″ CTU's have doubled production, replaced several machines, eliminated extra operations. *Write for Catalog 1787.*

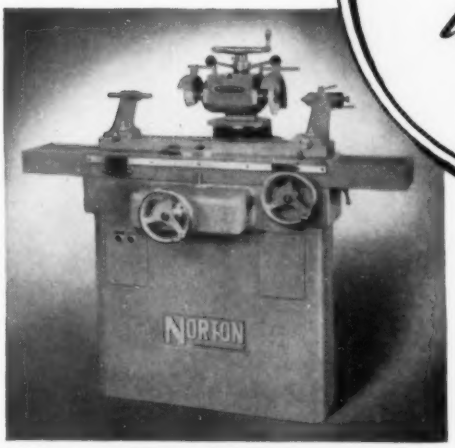



○ *Norton Special Purpose Grinders For Automotive Parts* include the 6″ x 8″ Semi-automatic Piston Grinding Machine, outstanding for high production and high precision. Fast sizing, automatic wheel truing and simplified operation are among the many advanced features. Work drive arrangements available for all types of piston relief grinding. *Catalog 742 gives full details.*

# complete line of

*money-saving grinders and lappers*

○ *Norton Surface Grinders* are well represented by this 8″ x 24″ Hydraulic Grinder. Designed with both hand and power table traverse and cross feed, it produces plane surfaces smoothly and speedily. Convenient controls and easy accessibility keep operating and maintenance times low. Extra equipment, such as magnetic chucks, wet grinding attachment and individual dust exhaust system meet all operating conditions. *Write for Catalog 190.*




○ *Norton Tool Room Cutter Grinders.* The No. 20 Cutter and Tool Grinder is the most versatile machine in its class. The wheel head tilts up to 15° above or below horizontal, and may be swivelled through 360° — simplifying such jobs as grinding taper reamers, step counterbores, form tools and milling cutters. Other pace-setting advantages include long table traverse and wheel slide travel . . . integral motor spindle . . . wheel slide graduated dials readable from any angle. No other cutter and tool grinder does so many jobs so fast, so easily. *Catalog 189 tells you why.*

○ *Norton Lapping Machines.* The Type 16FC Vertical Lapper brings you outstanding production capacity for such work as diesel injector parts, plug gages, size blocks, sides of small bearing races, pump gears and plates and many other parts. Laps flat work up to 3″ x 5″, and cylindrical work up to 3″ diameter, producing a high degree of accuracy and finish. *Catalog 212 gives you details.*

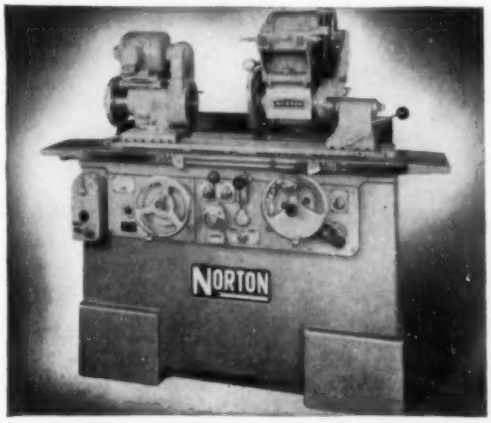
Only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.

The six machines shown here are typical products of that experience — bringing you ahead-of-the-parade design that speeds production and adds maximum product-value on every job they do for you.

But remember — these six advanced machines represent only a small fraction of the world's broadest line. Besides many models of cylindrical, surface, crankshaft and camshaft grinding machines, Norton produces a wide range of lapping machines, tool room grinders and special types for grinding pistons, valves, jet parts, etc.

A new illustrated folder #1843 lists the entire Norton line of grinding and lapping machines and tells you how to get all the facts on each unit.

**For your copy, contact your local Norton Representative.**



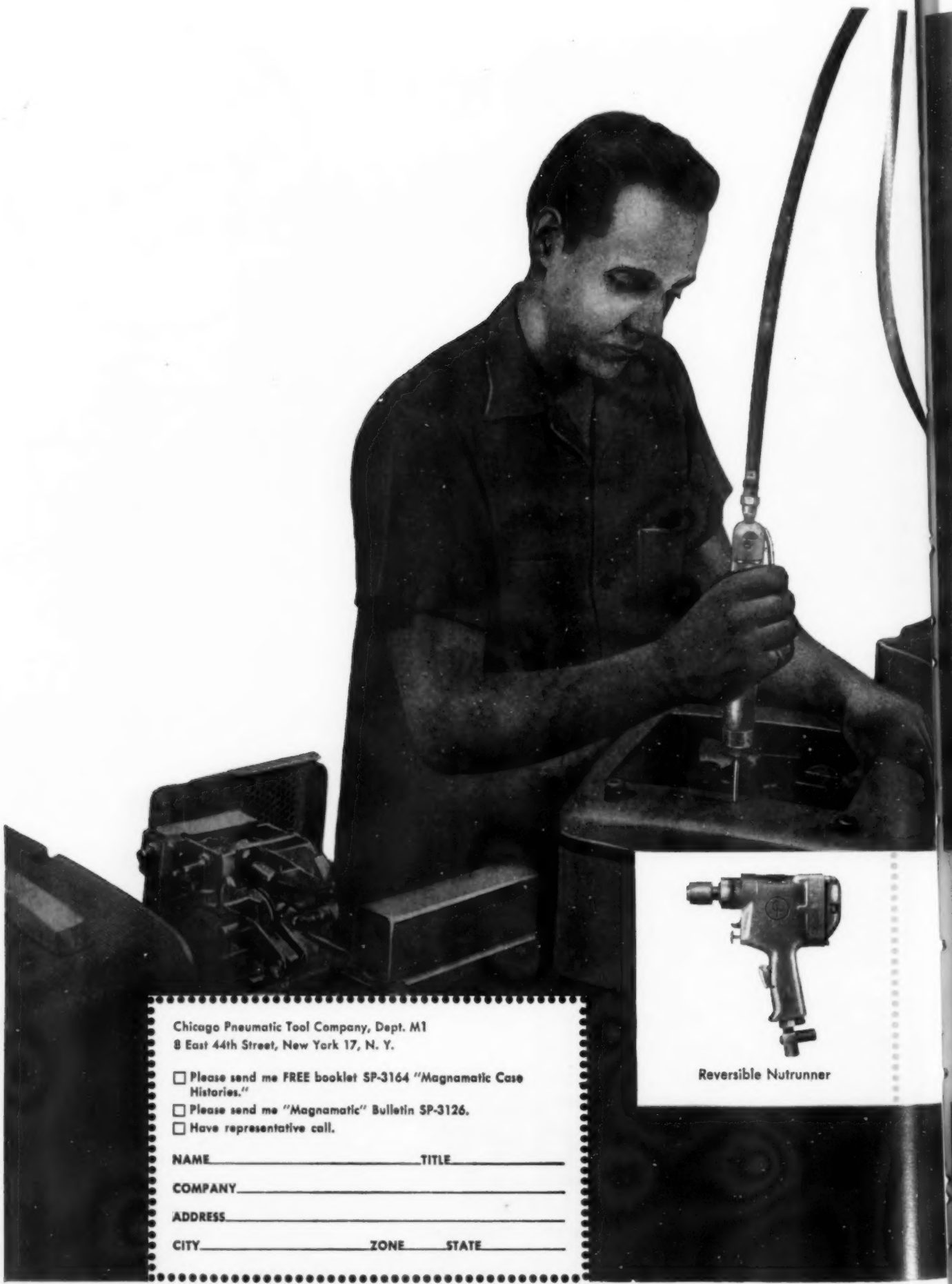

○ *Norton 10″ Universal Grinders.* The 10″ x 20″ Universal Grinder has the flexibility to handle an almost endless variety of jobs. Compound swivel arrangement of wheel head enables you to make separate angular settings of wheel and feed. External, internal, face or angular wheel slide operations are easy. Chuck may be mounted on one end of work head spindle, ready for use by turning head 180°. *Write for Catalog 170.*

**To Economize, Modernize With NEW**

**NORTON**

**GRINDERS and LAPPERS**

*Making better products . . . to make other products better*





Reversible Nutrunner

Chicago Pneumatic Tool Company, Dept. M1
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE booklet SP-3164 "Magnamatic Case Histories."
☐ Please send me "Magnamatic" Bulletin SP-3126.
☐ Have representative call.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

# NEW! Controlled-Torque power screwdriver-nutrunner

## the revolutionary CP "Magnamatic" with the one-shot clutch

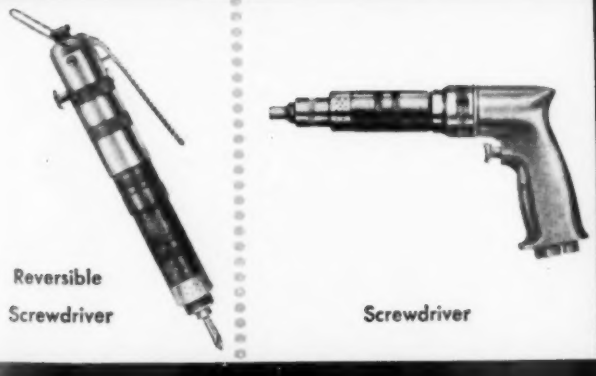
An air-driven torque screwdriver-nutrunner that can be preset to run one screw or thousands* to specified torque . . . that's the CP One-Shot "Magnamatic."

In design and operation "Magnamatic" is entirely new, but thoroughly proved in more than eighteen months of field testing and operation on production lines:

—an Alnico magnetic One-Shot clutch, adjustable to specified torques, disengages *completely* the instant the fastener is driven to the desired tightness. The clutch does not impact or ratchet—the irritating "buzz" of conventional tools is eliminated. Inexperienced or fatigued operators can't burr screw heads, strip threads, shear fasteners, or damage work surfaces. It is impossible to overdrive a nut or screw with a CP "Magnamatic" no matter how long the tool is held on the work.

A complete line of One-Shot "Magnamatic" Screwdrivers, reversible and nonreversible types, in capacities from #4 screws to $\frac{3}{8}$" bolt size, is now in production.

*On the assembly line of a midwestern manufacturer, an operator is running 16,000 #6-32 screws per day with "Magnamatic" to a critical torque specification.



Reversible Screwdriver

Screwdriver

ONE-SHOT "MAGNAMATIC" SCREWDRIVER-NUTRUNNER

- —can be preset to drive fasteners to specified torques.
- —maintains the selected torque setting indefinitely.
- —has no clutch jaw wear.
- —disengages the instant the fastener is run to desired tightness.
- —eliminates the need for skilled operators.
- —eliminates stripped threads, sheared fasteners, surface damages.
- —prolongs service life of screw bits.

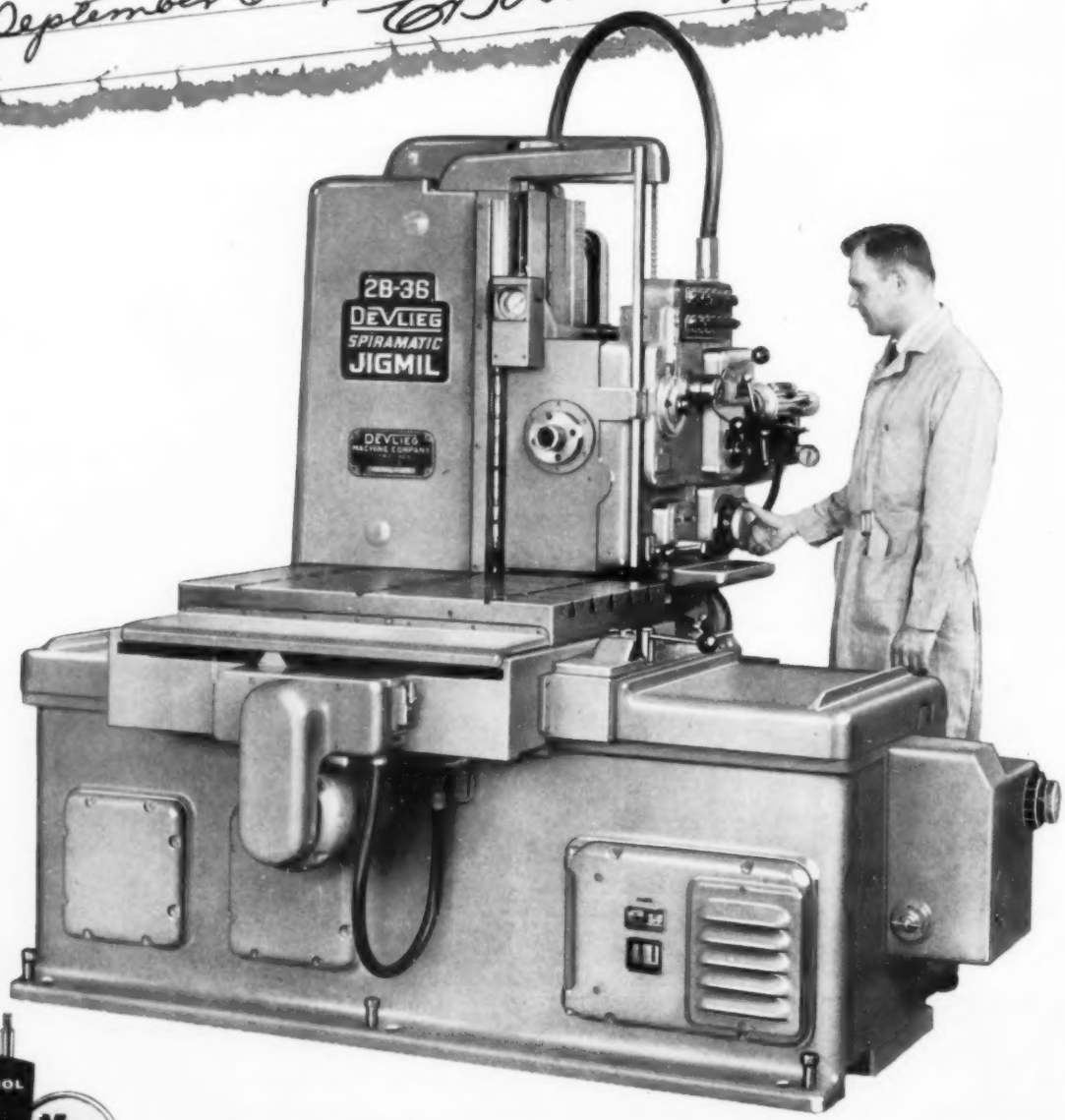
Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Be sure to see this Brand New Model 2B-36 DeVlieg Spiramatic Jigmil which will be introduced at the Machine Tool Show at Chicago—

See this new machine "JIGLESS BORING" parts under production conditions at the DeVlieg Exhibit, Booth 1317, September 6-17

C B DeVlieg

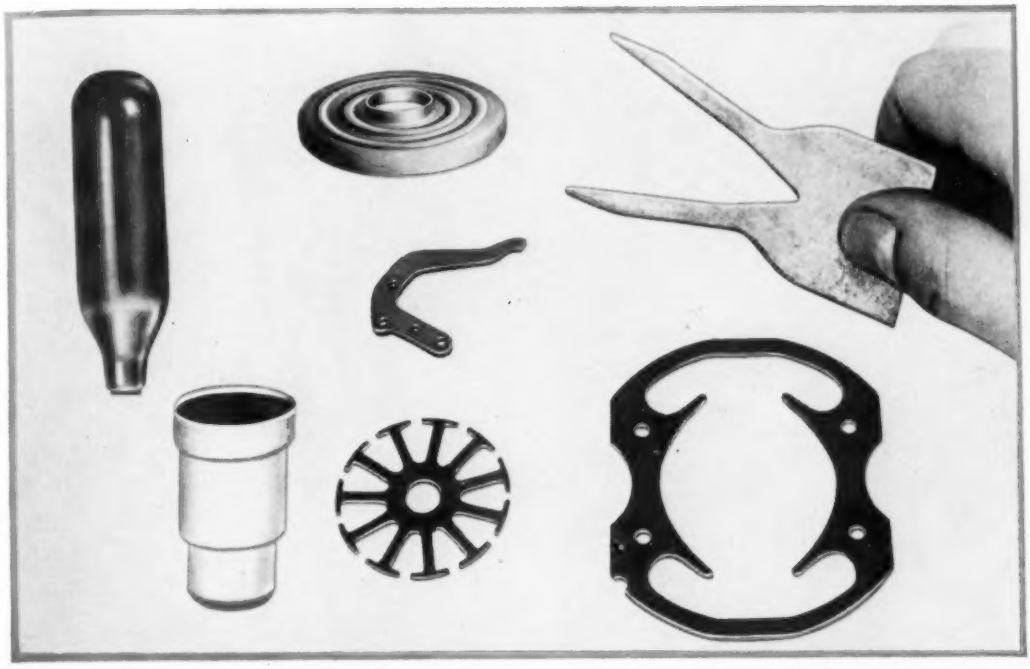



THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1950
INTERNATIONAL AMPHITHEATRE

**DE VLIEG MACHINE CO.** 450 FAIR AVE., FERNDALE • DETROIT 20, MICH.

Large or small,
simple or complex . . .

# Carboloy carbide-equipped dies outproduce steel 10 to 50 times



Typical parts produced faster, and at less cost, with Carboloy carbide-equipped dies. These carbides are supplied rough-finished or, where desired, precision-finished, for application by you or your diemaker.

FROM SIMPLE notching dies to complex lamination dies, Carboloy® cemented carbides bring users from 10 to 50 times more production.

Dies equipped with Carboloy carbides cut maintenance and downtime costs . . . produce burr-free, close-tolerance parts.

These carbides have proved their over-all efficiency on hundreds of drawing, forming, blanking, and piercing jobs. And, in every case, brought spectacular production increases . . . at lower cost.

Carboloy engineers are ready to work with you or your diemaker on the design and application of carbide dies. For more information on Carboloy cemented carbides, write, or send coupon, today.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

**CARBOLOY**
**DEPARTMENT OF GENERAL ELECTRIC COMPANY**

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

**Carboloy Created-Metals for Industrial Progress**

**CARBOLOY**
**Department of General Electric Company**
**11101 E. 8 Mile Street, Detroit 32, Michigan**

- ☐ Send me Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on Carboloy Die Training School.
- ☐ Have a Carboloy Field Engineer call at my plant.

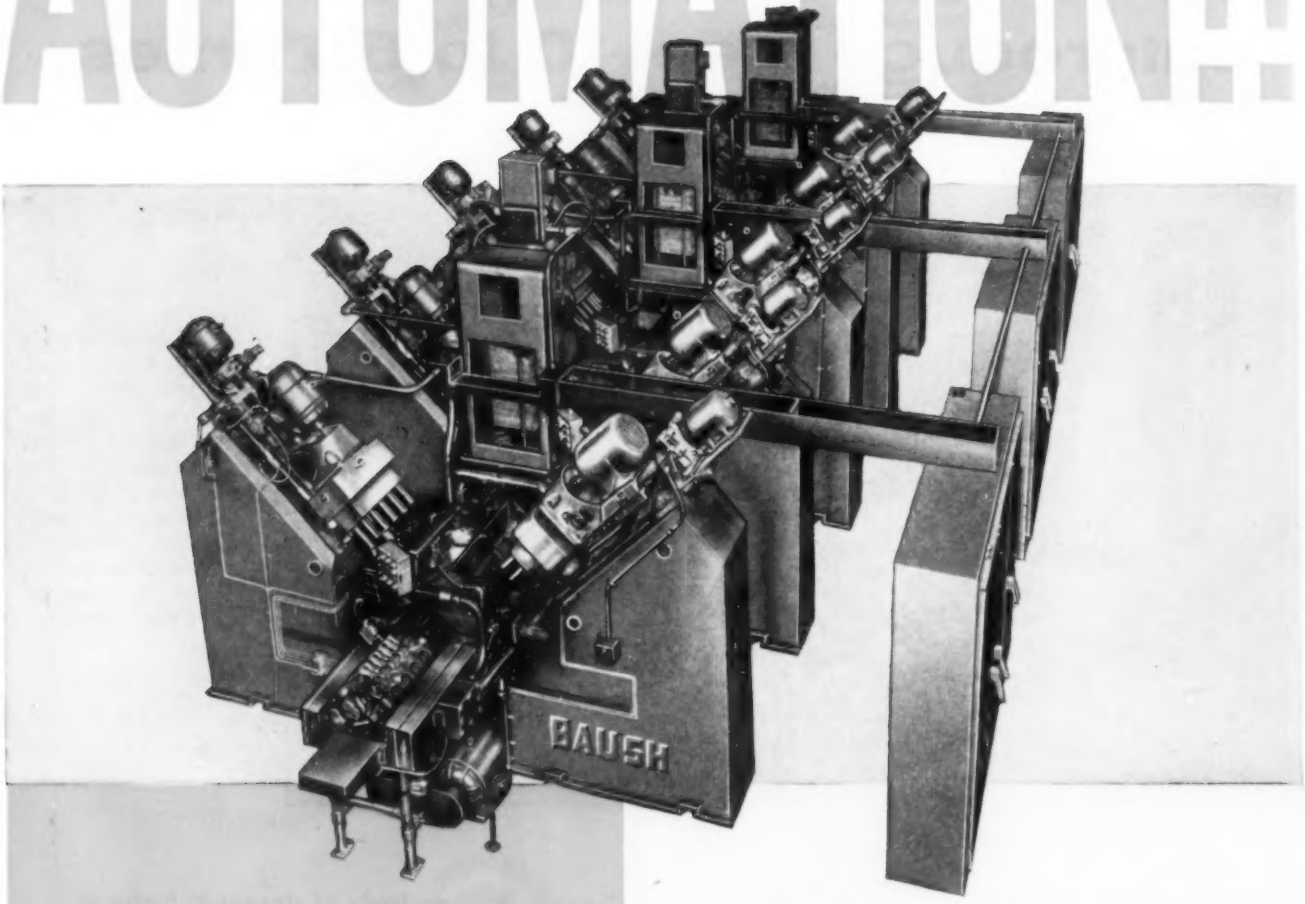
Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

# AUTOMATION!!




## BAUSH 6-Section Transfer with 27 Stations Automatically Performs 9240 Operations on 69 Automobile Cylinder Blocks Every Hour!!!

**BAUSH**
**MACHINE TOOL CO.**
**SPRINGFIELD 7, MASSACHUSETTS**

Once again a leading automobile engine maker selects BAUSH TRANSFER EQUIPMENT for efficient and economical production. Noted for their sturdy construction BAUSH TRANSFERS give day-in and day-out production with the very *minimum* of "down time" for maintenance.

This transfer has thirty (30) Baush Model "S" Mechanical Leadscrew units with 18" max. stroke — arranged and mounted on individual columns in vertical, vertical angular and compound vertical angular positions for various operations. It has —

1 Load Station — 12 Work Stations
2 Roll-over Stations to dump chips
11 Idle Stations for ease of tool change or maintenance
1 Unload Station.

Blocks mechanically transfer from station to station and locate and clamp hydraulically at each work station. A total of 134 spindles, drill, chamfer, ream, mill, core-drill and counterbore 69 V-8 Cylinder Blocks every hour at 100% efficiency.

# STANDARD TOOL

## ....serving Industry since 1881

*Announces* A NEW LINE OF

## *Carbide-Tipped Tools*

• To broaden its service to you, Standard Tool now offers carbide-tipped tools in addition to its regular line of industrial cutting tools.

Your Standard Tool Man, Serving Industry Since 1881, will show you many applications where carbide-tipped tools will help you get faster cutting, longer tool life.

# STANDARD TOOL CO.

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special and Carbide-Tipped Tools*

# DISSTON STAINLESS STEEL

## ...hot rolled to SHAPE

## saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

**LESS MACHINING.** Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

**REDUCTION IN WASTE MATERIAL.** Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

**LOW-COST HANDLING OF SMALL ORDERS.** Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

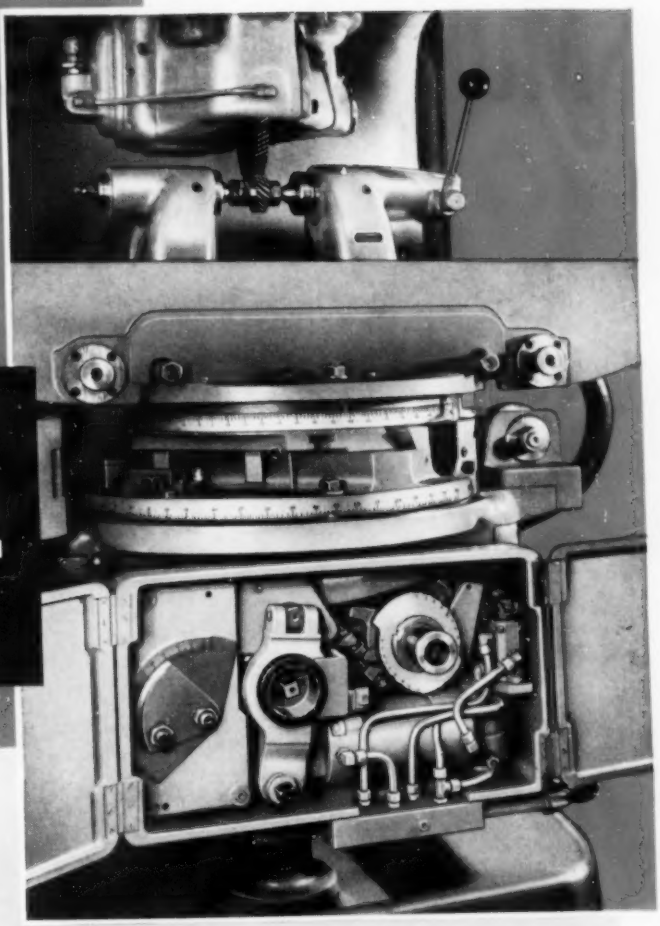
**Henry Disston & Sons, Inc., Steel Sales Division**
**892 Tacony, Philadelphia 35, Pa., U.S.A.**

**DISSTON HAS THE EDGE®**
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING

# SPEED Gear Shaving and Reduce Costs with

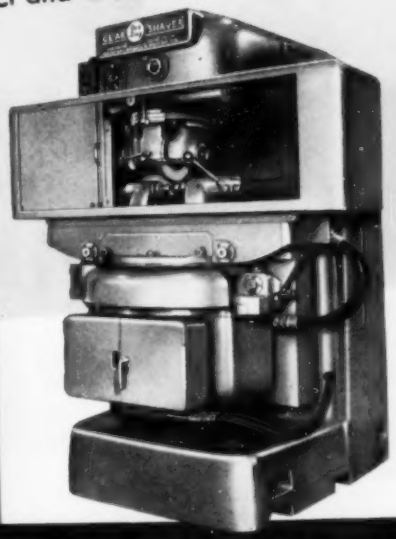
# AUTOMATIC DIFFERENTIAL UP-FEED



Red Ring Automatic Differential Up-Feed, one of the great developments in the mechanics of gear shaving, offers you such important advantages as:

- Automatic multi-stroke shaving cycle of selected increments of feed and dwell.
- Saves 5 to 10 seconds on each work unit.
- Prolongs cutter life up to 200%.
- Eliminates operator's errors and resultant cutter breakage.
- Minimizes operator fatigue.
- Greatly reduces loading and unloading time.
- Comes from backlash into feed for first cutting stroke about three times faster than that of any other device known.
- Every element of the cycle is positive, precise and fast.

The Automatic Differential Up-Feed is available on Red Ring Shaving Machine Models GCI and GCU.



**See us at the Machine Tool Show, Booth 1215.**

*Write for Descriptive Data*

7250

**NATIONAL BROACH & MACHINE CO.**

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

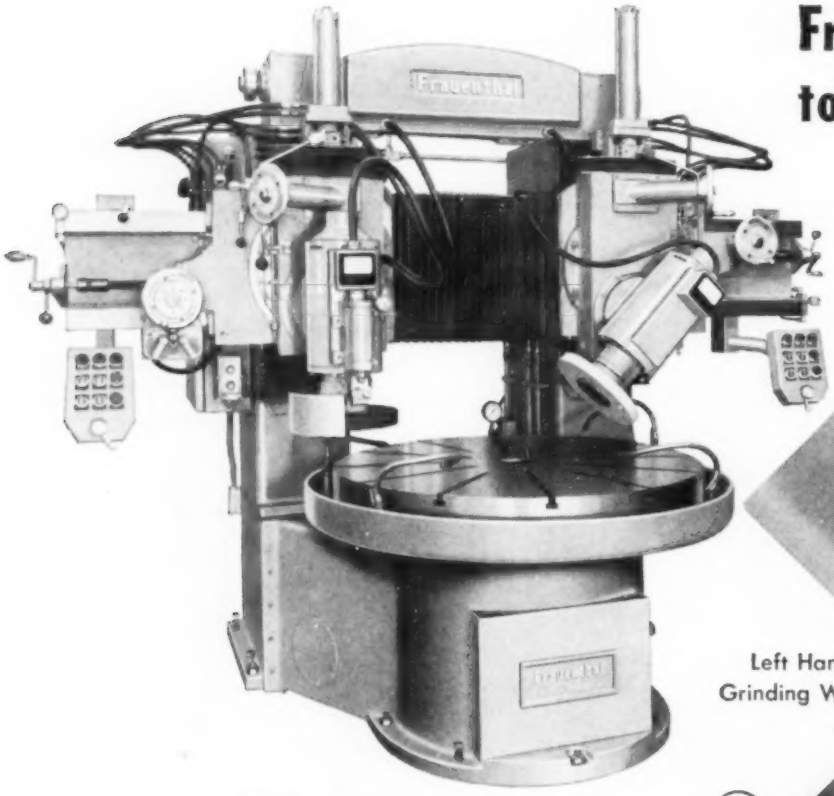
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

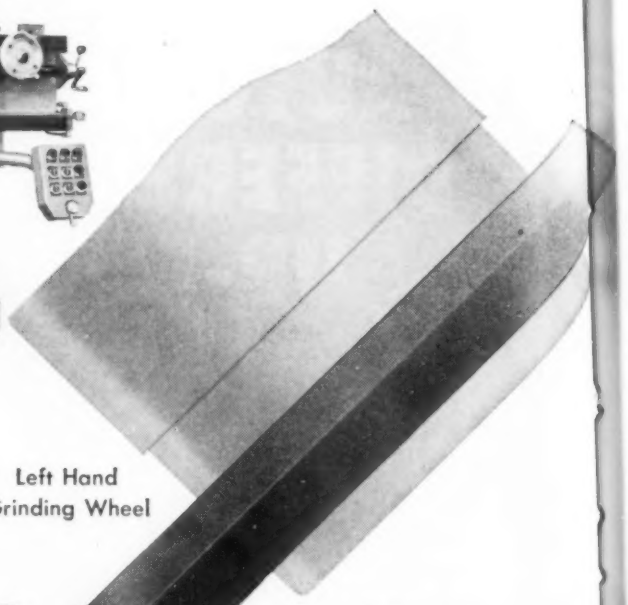


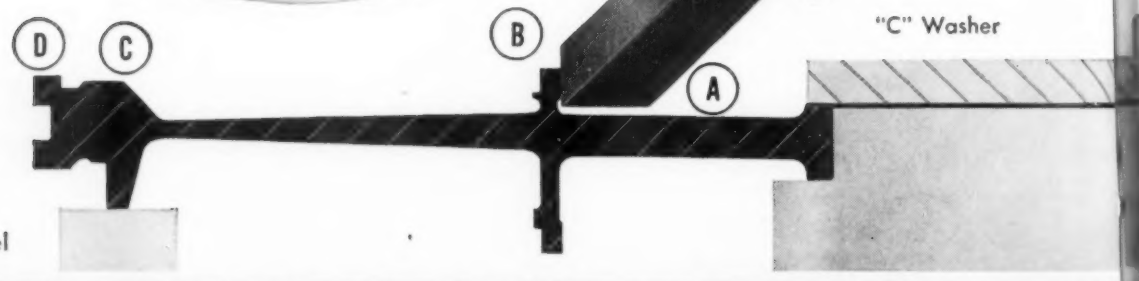
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-55

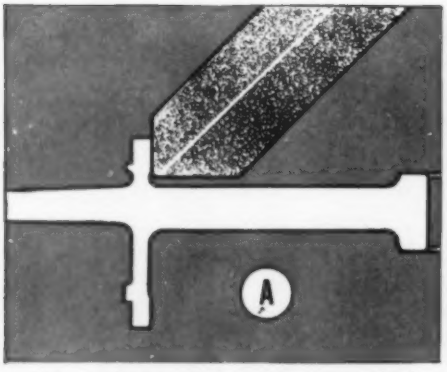
# Multiple Grinding Operations

## Frauenthal 1800 Series tolerances . . . assures

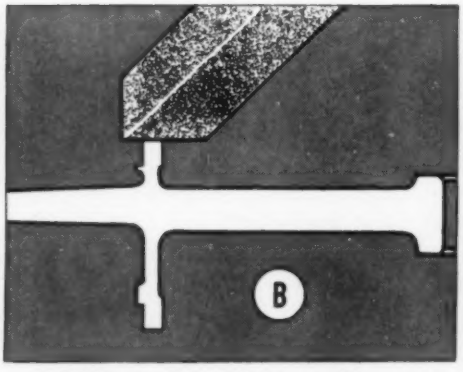




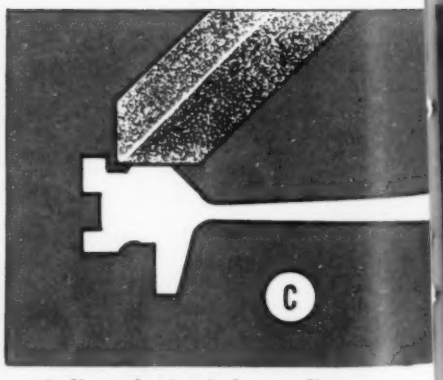




Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.




Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand




grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

# Frauenthal Division

# in One Set-Up

## Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.

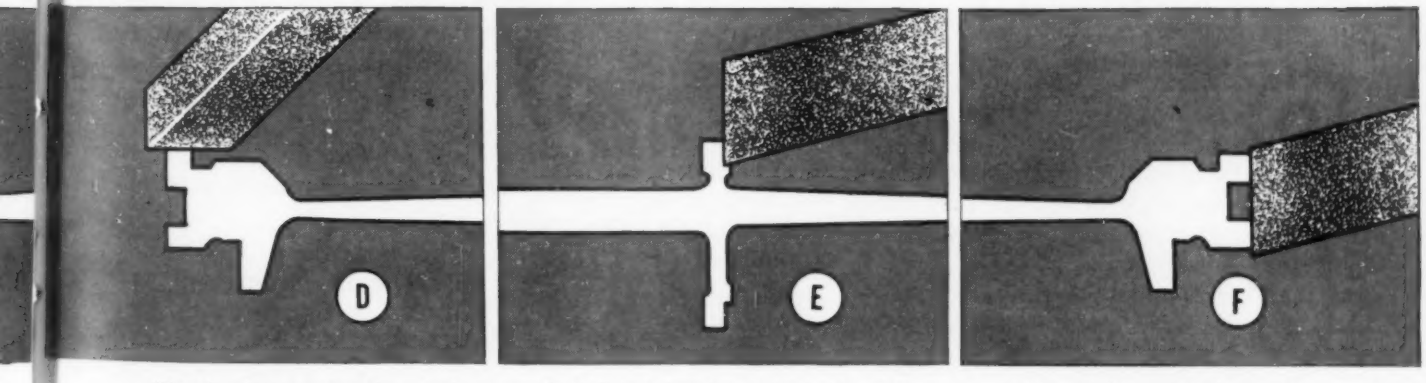
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

BOOTH NO. 806



***Free Catalog!***

**For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.**




Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

# THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN

## BOOTHS 410 and 411 at the NAVY PIER

See the completeness and diversification of the Kennametal line of sintered carbide tooling, which includes several thousand individual items available from stock at all times to help you do a better job on any type of machining operation . . . to help you cut tooling costs, step up production, reduce machine downtime.

## BOOTH 123, North Hall
## INTERNATIONAL AMPHITHEATRE

Let us demonstrate the best techniques in grinding carbide tooling, at our service booth, as we recondition Kennametal tools used for demonstrations by machine tool builders during the show.

And we'll be glad to discuss your machining problems and how Kennametal can help you solve them.

Drop in at both booths . . . and be sure to get information about K21, the new Kennametal composition that is outperforming all other General Purpose Steel Cutting Grades. KENNAMETAL INC., Latrobe, Pennsylvania.

*Registered Trademark

## *Most complete line of carbide tooling*

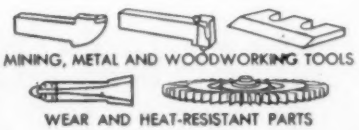
Kennametal makes available top quality sintered carbide inserts, brazed tools, button tools, clamp tools and accessories, with cutting edges in diversified grades of hardness, toughness, heat and corrosion resistance and other properties. Write for a copy of Kennametal Catalog 55 and of Characteristics Book B-111.

**Give your machines the tools they deserve . . . the BEST**

7269

**Be sure to see the complete line of Kendex* Button Tools and K21 . . . the New, Superior General Purpose Steel Cutting Grade**

INDUSTRY AND
**KENNAMETAL**
*. . . Partners in Progress*



# First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.

# Conomatic

THE MACHINE TOOL SHOW
CHICAGO, ILL.
BOOTH 401

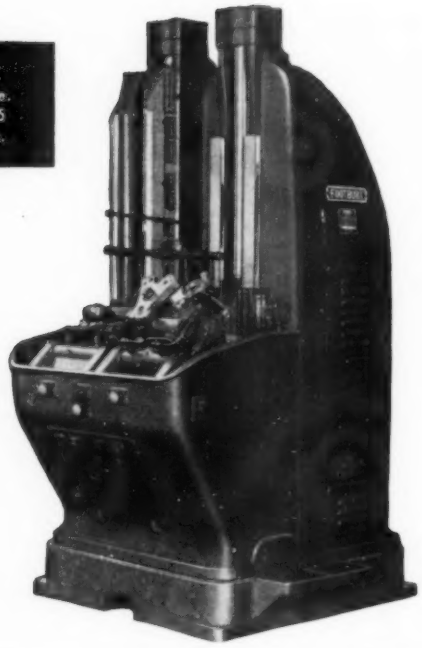
CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-59

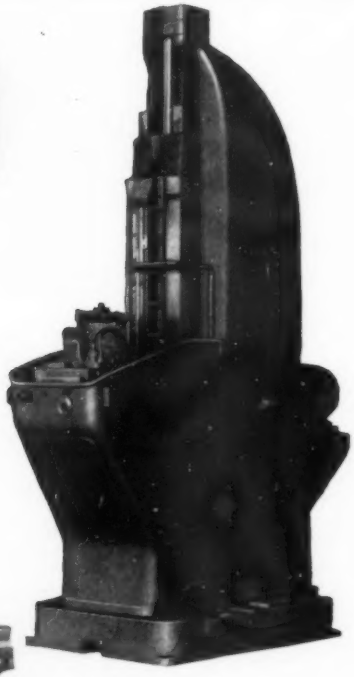
# A FASTER *more economical* MACHINE OPERATION

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

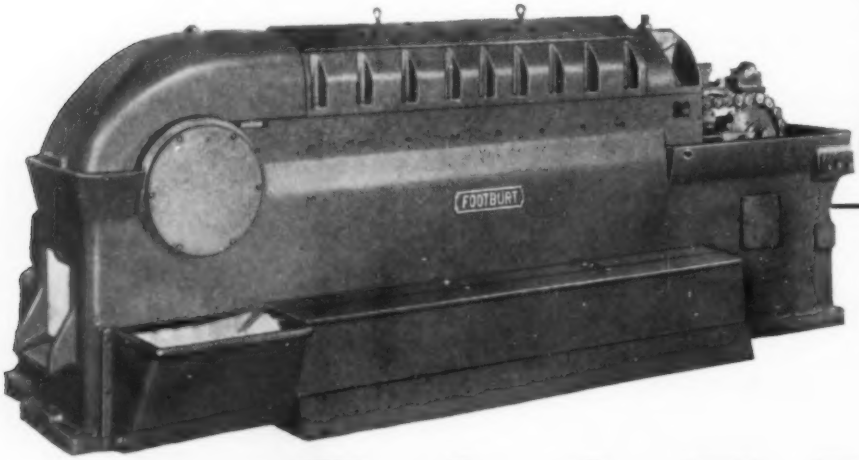


■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



**THE FOOTE-BURT COMPANY**
**Cleveland 8, Ohio**
Detroit Office: General Motors Building




Continuous Type Broaching Machine. Made in 5 Sizes.

# FOOTBURT

**PIONEERS IN SURFACE BROACHING**

# How to get the type of bushings you want in *your* die sets

Best way to get the quality die sets you want *plus* the type of bushing and pin assembly you prefer is to stamp "USE DETROIT DIE SET" on your blueprints. For here, along with a *full-value* die set, you have a choice of a dozen different bushing assemblies. For instance, the new *self-oiling bushings* that automatically lubricate friction surfaces. And then such types as *ball-bearing assemblies, Lamina bronze-plated bushings* with or without clamps, and solid *Ampco bronze bushings* with Alemite fittings.

For precision die work, specify a precision Detroit Die Set with the type of bushing that answers your specific needs.

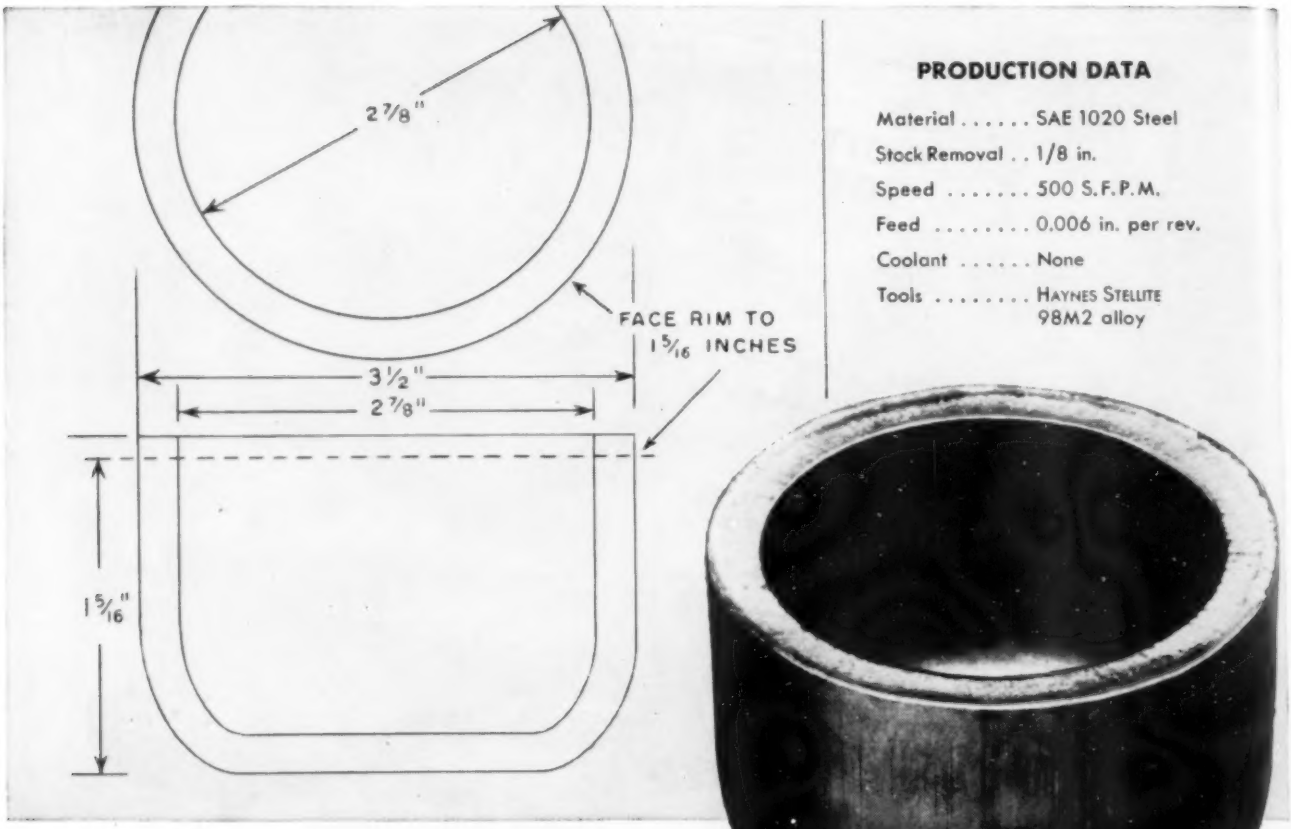
***Offices in Principal Industrial Centers***

**Detroit DIE SET CORPORATION**

**2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN**



FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-8-61




**PRODUCTION DATA**

| | |
|---|---|
| Material | SAE 1020 Steel |
| Stock Removal | 1/8 in. |
| Speed | 500 S.F.P.M. |
| Feed | 0.006 in. per rev. |
| Coolant | None |
| Tools | HAYNES STELLITE 98M2 alloy |

# 1,000 PIECES MACHINED PER GRIND ...despite rough, uneven cut

HAYNES STELLITE 98M2 tools machine over a thousand of these torque converter cups between grinds. The cups are deep drawn from SAE 1020 steel, and are plunge cut. The area to be machined is rough and uneven. The HAYNES STELLITE tools operate for a full eight-hour shift, at a speed of 500 surface feet per minute, without chipping or spalling. No coolant is used.

HAYNES STELLITE tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. This same combination of properties makes them valuable on all machining jobs. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they can take deep cuts.

For information on how HAYNES STELLITE tools can help speed up your machining jobs, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, and the machinability of metals.

HAYNES TRADE-MARK ALLOYS

**HAYNES STELLITE COMPANY**

**A Division of Union Carbide and Carbon Corporation**

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

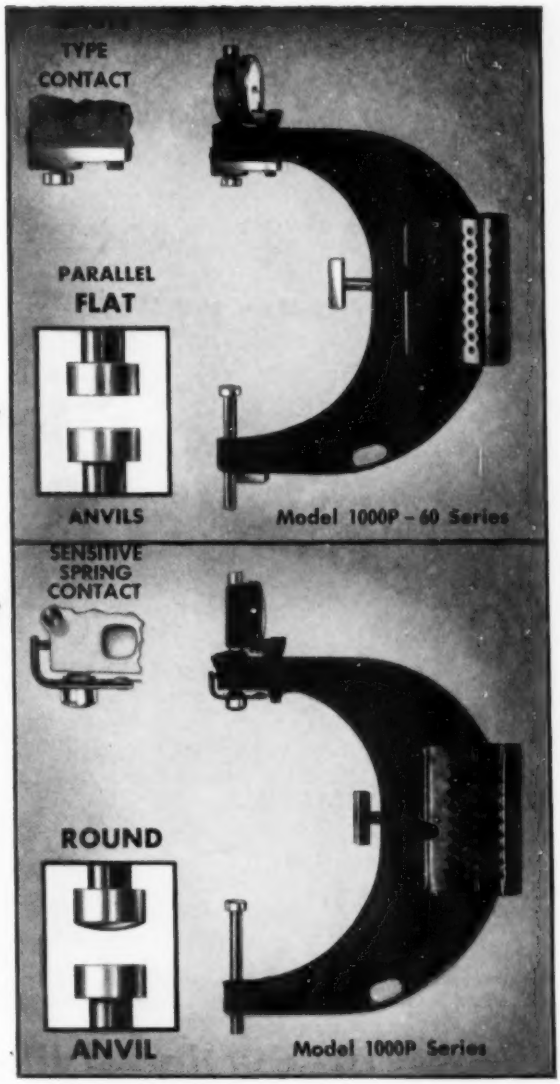
*"Haynes" and "Haynes Stellite" are registered trade-n.arks of Union Carbide and Carbon Corporation.*

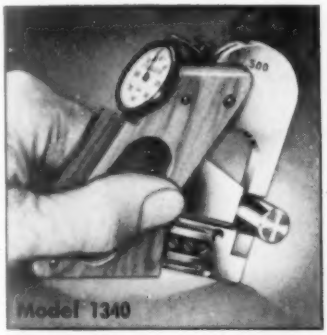
# You can have your SNAP GAGE as you want it —

**ALL CONTACTS —**
***Either TUNGSTEN CARBIDE for enduring accuracy or STEEL for price.***

**FLAT, PLUNGER ANVILS** where anvils must gage close into corners of shoulders and yet remain perfectly parallel at all times. Gage is adjustable yet maintains accuracy, graduated in tenths.

**ROUND, SPRING ANVILS** for more general requirements. Sensitive contact: spherical. Lower: flat and adjustable. Inexpensive, fast and accurate, graduated in tenths.




**SMALL FLAT ANVILS** either single dimension or adjustable. Gages close to shoulders — anvils remain parallel. Light, sensitive, positive. Nearest style to "fixed" snap gages.

**RETRACTING ANVIL** for super finishes and soft material. Sensitive, flat lapped anvils remain parallel throughout adjustment.

**RUGGED PLUNGER TYPE** for heavy duty. Upper anvil has spring tension sufficient to counteract weight of gage and operator's hand.

**RUGGED SPRING TYPE** lower anvil is sensitive so that weight of gage and operator's hand rests on the fixed contact.

## We make Indicating Snap Gages to suit any whim or necessity

These Gages are made to meet all the usual physical and accuracy needs of gage users. They can be had in a wide range of sizes and can be modified to suit particular needs. If you haven't seen just what you *must* have, ask us about what you want. We also make Air Snap Gages.

**FEDERAL PRODUCTS CORPORATION**
**Dept. 1F • Providence 1, Rhode Island**

*Ask* **FEDERAL**
***FOR MODERN GAGES AND GAGING TECHNIQUES***

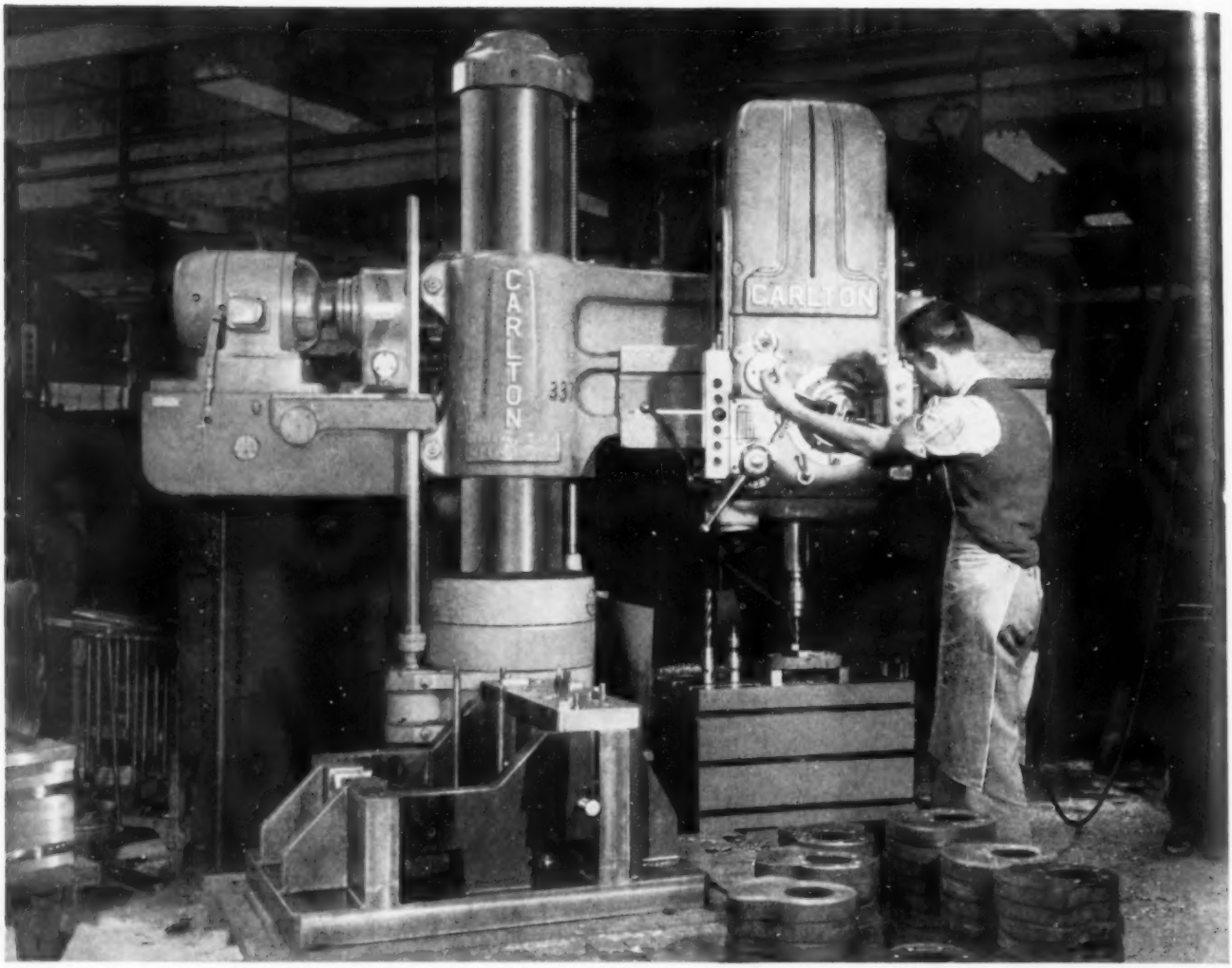
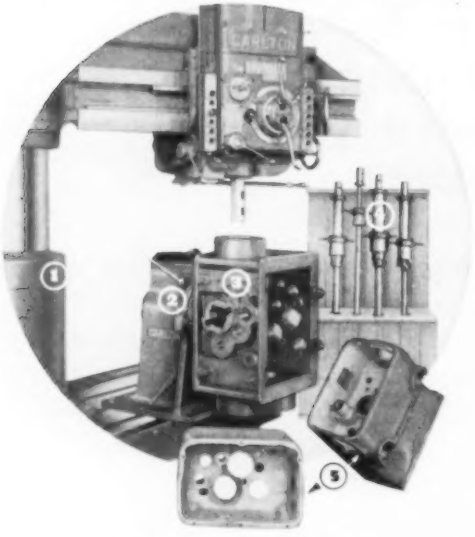



photo courtesy the Besser Co., Alpena, Mich.

# Carlton production drilling for production line assembly




*Running time reduced from 7* hours on previous method to 5.25 on this Carlton engineered set-up:
(1) Carlton 3-A radial drill
(2) master trunnion
(3) revolving jig
(4) boring bars
(5) transmission body casting
25% savings effected by eliminating horizontal operation.

Carlton radial drills, properly tooled, give you production hole drilling with the precision performance so necessary for production line assembly. Parts come out of the drill jig with the uniformity that permits interchangeability of parts, eliminates unnecessary operations, makes substantial savings.

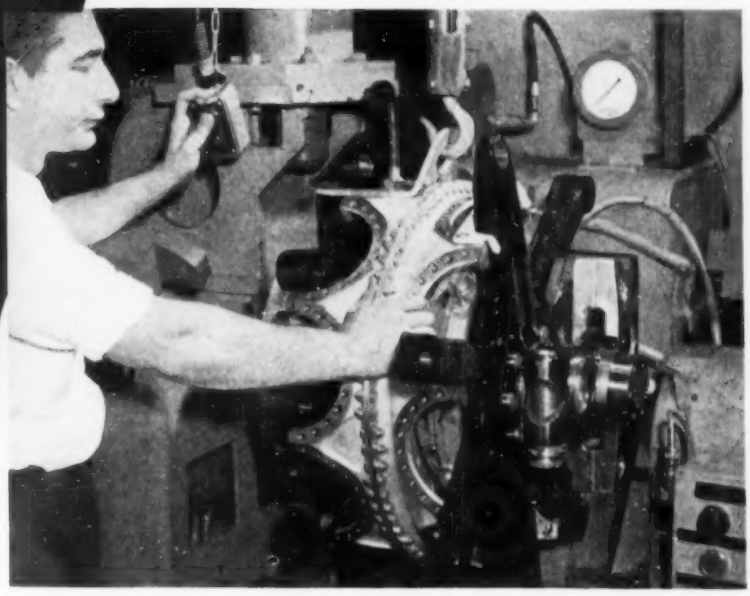
Carlton engineers will be glad to work with your engineers in recommending the best Carlton and the most efficient tooling for your requirements. Carlton radial drills are made in 5 models with arm lengths from 3-ft to 12-ft and column diameters from 9″ to 26″. Carlton horizontal drills made in 4H and 5H sizes. For complete information, call your machine tool distributor, see the Carlton brochure in Sweets Machine Tool Catalog, or write . . .

Carlton

**THE CARLTON MACHINE TOOL CO.**
CINCINNATI 25, OHIO

**HORIZONTAL AND RADIAL DRILLS**

A Curtiss-Wright operator lifts the completed sub-assembly of a Turbo Compound engine crankshaft from a special machine . . . part of the first progressive, automated assembly line in the aircraft industry, now in operation at the corporation's Wright Aeronautical Division, Wood-Ridge, N. J.



## Special Bath Taps .... Save 50% Operating Time!

Make one tap do the work of two . . . it sounds like a production man's dream . . . yet, Bath engineers solved the problem!

Instead of a set of 2 taps — a rougher and a finisher — now, holes are accurately threaded for bolting counter-weights to the main crankshaft of the Curtiss-Wright Turbo Compound engine in a single pass — saving one-half the operating time . . . reducing tap costs.

The solution of such problems by Bath is the result of years of engineering and manufacturing experience in the production of the finest quality custom and regular ground thread taps — built up to a standard and not down to a price.

If you have a tapping problem, why not send us full details!

*Insist on BATH TAPS for BETTER THREADS*

# JOHN BATH & CO., Inc.

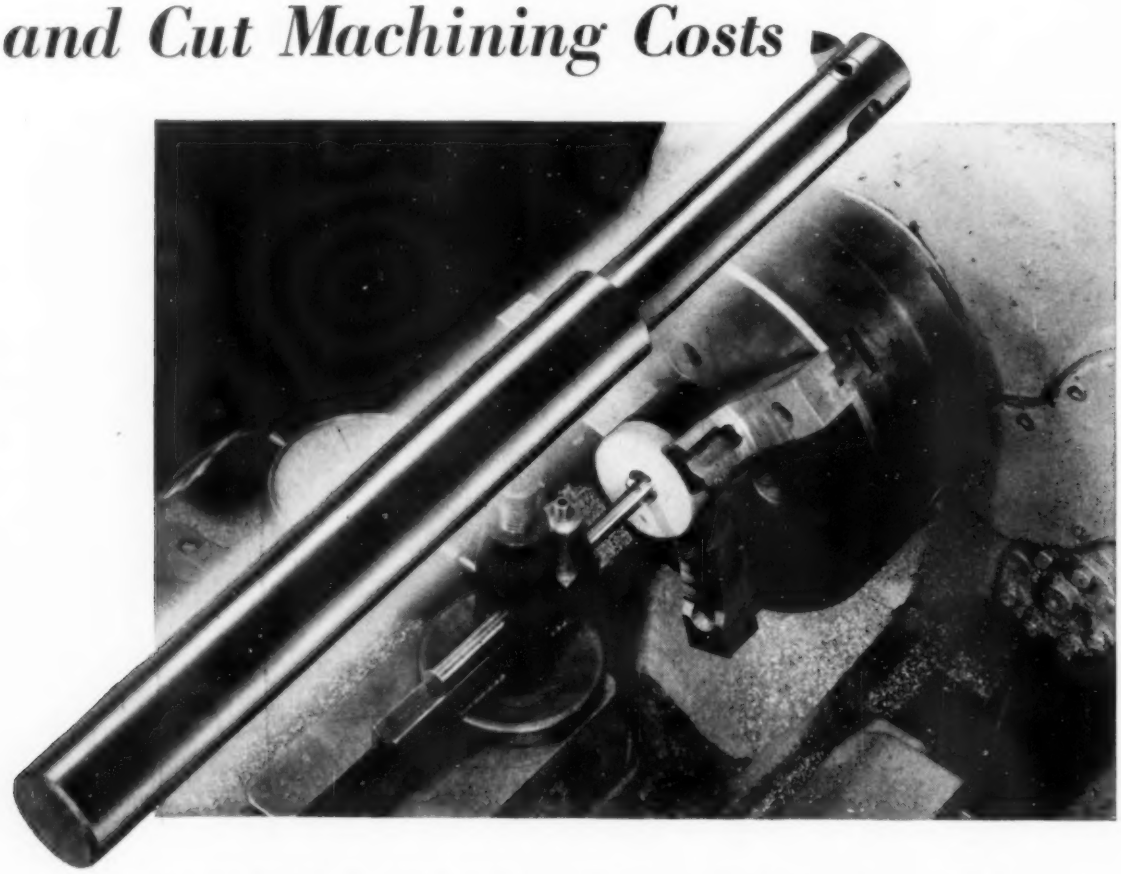
**28 Grafton St., Worcester, Mass.**

**PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS**



FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-8-65

# *The New Way to Reduce Chatter and Cut Machining Costs*



# ...MALLORY No-Chat* Boring Bars

VIBRATION of cutting tools can be nearly eliminated and overall machining costs substantially reduced when you use Mallory No-Chat boring bars. Made from a unique alloy developed by Mallory metallurgical research, they are more than twice as dense as steel, and have far greater rigidity, tensile strength and thermal conductivity.

*No-Chat* bars permit you to make deep inside cuts with long tool overhang. You can often turn small diameters that used to require finish grinding.

*Longer production runs.* Tips last far longer between grinds, because they run cooler and hold their edge longer.

*Heavy cuts per pass* are possible because vibration is damped out at the source . . . another saving in production time.

*No-Chat bars are re-usable.* Just replace the tip. Non-annealing *No-Chat* metal eliminates grain growth troubles.

A wide selection of square and round stock is available, in sizes useful for boring bars, tool shanks and for planer or shaper tools. Write to Mallory today for our bulletin that gives complete technical data on this unique way to do better machining at lower cost.

*Trade Mark
Patent Applied For

***Expect more . . . Get more from MALLORY***

*In Canada made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario*

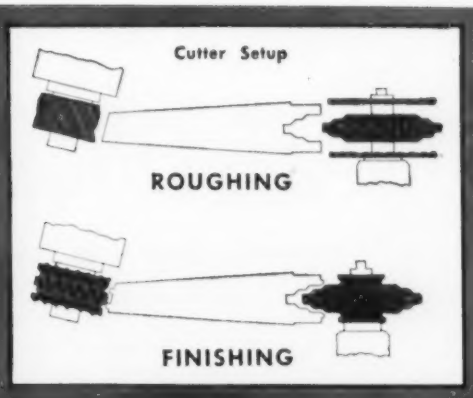
P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

**Serving Industry with These Products:**
**Electromechanical**—Resistors • Switches • Television Tuners • Vibrators
**Electrochemical**—Capacitors • Rectifiers • Mercury Batteries
**Metallurgical**—Contacts • Special Metals and Ceramics • Welding Materials

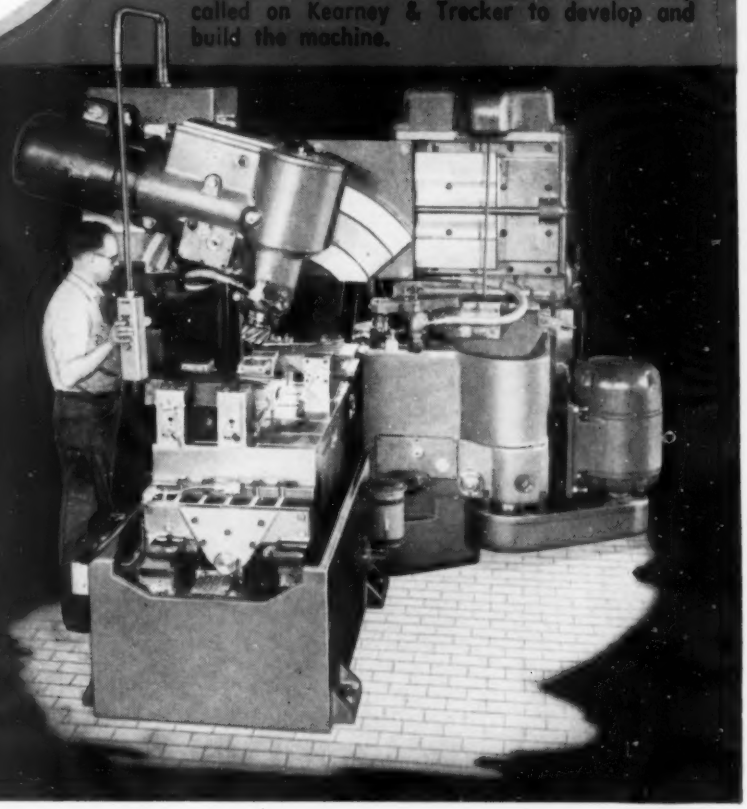
**For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio**

# CUSTOMER SPECIFIED

# KEARNEY & TRECKER MILWAUKEE DESIGNED




**A leading electrical equipment manufacturer needed a production machine to rough-and-finish mill a variety of sizes of chrome-nickel-steel steam turbine blades — 4" to 30" long. Specifications called for a machine that would cut milling costs and maintain accuracies within thousandths of an inch. Solution: They called on Kearney & Trecker to develop and build the machine.**



Production rates are dependent upon workpiece size. For example, twenty-seven 13½" chrome-nickel-steel blades are rough-and-finish milled per hour by this new Kearney & Trecker Two-Spindle Bed Type machine.

Rectangular index table with two work-holding fixtures enables the operator to unload and load one fixture while the other is in work. This sequence eliminates down-time and keeps production constant.

Dovetail end of blade is rough-and-finish milled with the lower spindle, using a combination of special form and side mills. Head, mounted in an inverted position on a saddle, is counterweighted. Tenon end of blade is milled with the upper vertical head which moves in an arc on radial ways . . . angular adjustment of 45° is possible.

Other machine features include air-clamping for machine table . . . automatic chip conveyor . . . high volume coolant pump . . . easy to change pick-off gears for each head to select exact desired spindle speeds.

## New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

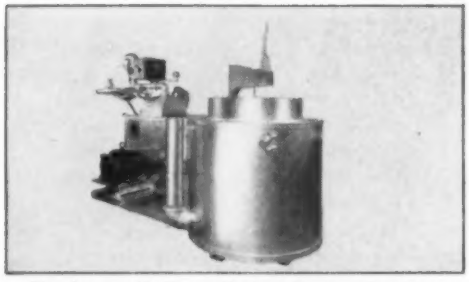
*For more details on machine illustrated ask for Data Sheet No. 1067. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.*

**Special Machinery Division**

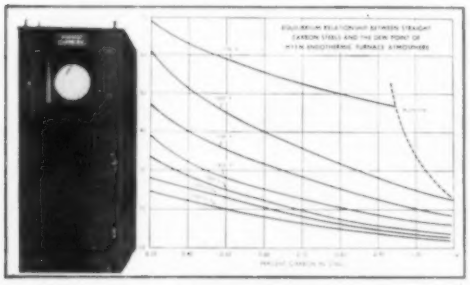
**MILWAUKEE 14, WISCONSIN, U.S.A.**

***Builders of Precision and Production Machine Tools Since 1898***

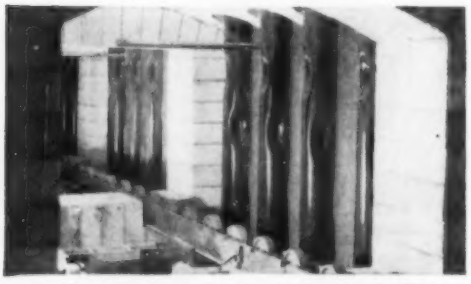
# HERE AT LINDBERG WE'RE GETTING YOU ABOUT A GREAT NEW FURNACE



The famous Lindberg Cyclone Furnace has been reducing costs and improving quality of tempering, annealing, nitriding, stress-relieving and nonferrous heat treating for 20 years.



Lindberg dew-point equilibrium curves accurately determine carbon potential in endothermic atmospheres and Lindberg Carbotrol unit controls these values automatically.



The Lindberg vertical radiant tube is only 59 in. long, weighs only 29 lbs. Easy to change. Exclusive "dimple" design insures combustion over length of tube.

There's real furnace news coming from Lindberg.

When metal needs heat Lindberg, over the years, has consistently pioneered better ways to apply it. A revolutionary new development to be announced in September climaxes a long list of Lindberg firsts.

In 1935 Lindberg's famous Cyclone furnace replaced radiation convection with high speed 100% forced convection.

The world's first high temperature (2200° F.) Hyen (endothermic) gas generator was introduced in 1942.

1943 saw 100% high speed convection pushed up into the high temperature field (1750° F.).

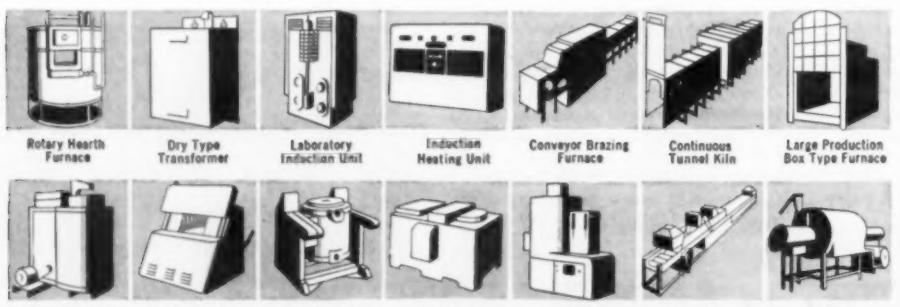
The introduction of the two-chamber aluminum induction melting furnace came in 1947.

In 1948 Lindberg developed the first high frequency method for measuring carbon and sulphur in steel.

An enamel-coated alloy, vertical radiant tube, providing fast heat release in relatively short length for carbonitriding and carburizing, was brought out in 1953.

In 1954 Lindberg released the first comprehensive set of dew-point equilibrium curves to determine accurately carbon potential in endothermic atmospheres and also introduced the Lindberg Carbotrol unit to control these values automatically.

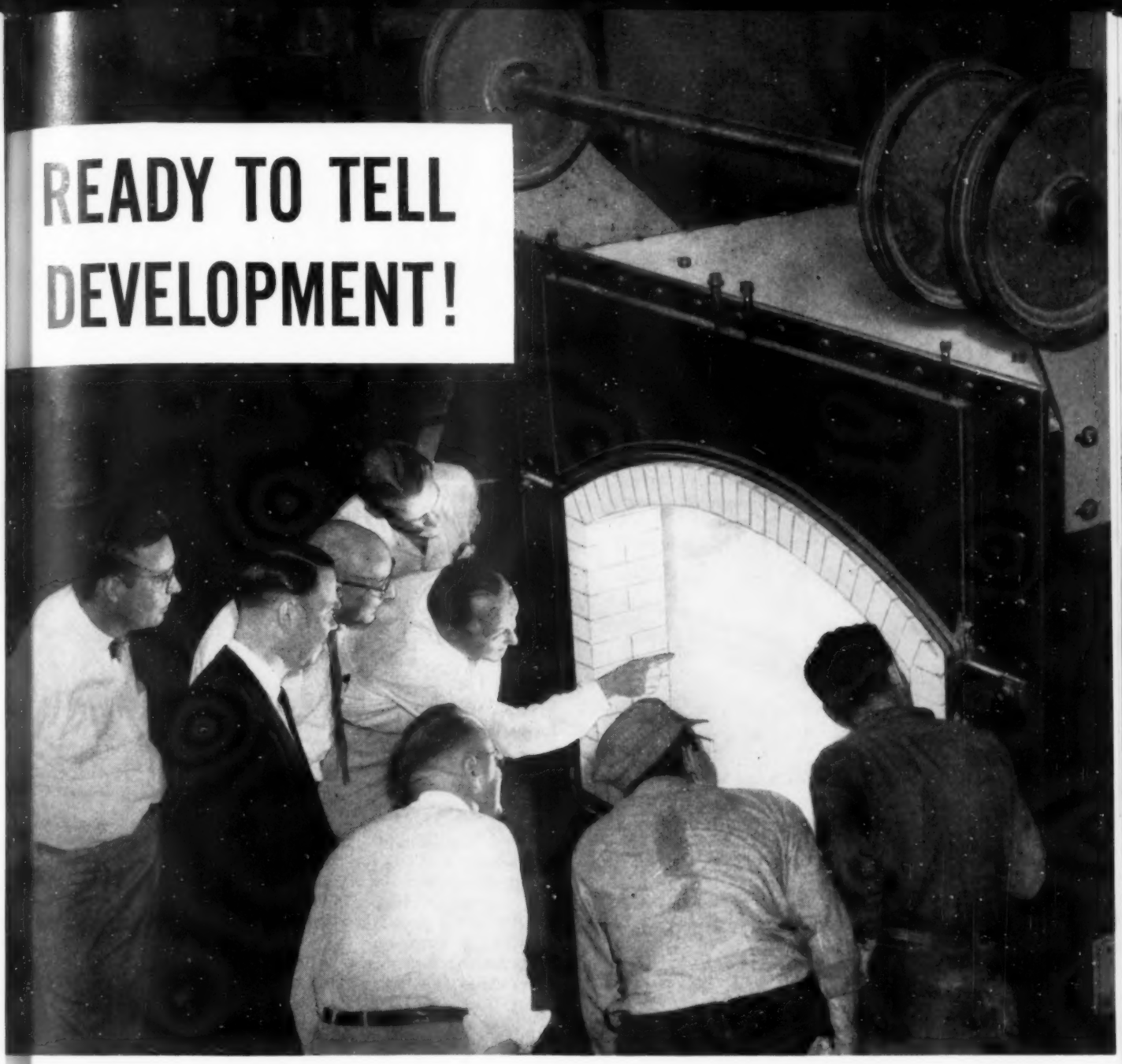
You can continue to look to Lindberg for the improvement of the processes of applying heat industrially. Particularly, watch for the announcement next month of one of the most revolutionary developments ever made in the furnace field.




Lindberg manufactures many kinds of equipment in the industrial heating and related fields. A few of these are symbolized here. If you are interested in any of these, please write us for the specifics on them, or get in touch with your nearest Lindberg Field Engineer. (See your classified telephone book.)

Associate Companies: Lindberg Industrial Corp., Chicago • EFCO-Lindberg, Ltd., Montreal • Lindberg Italiana, Milan • The Electric Furnace

# READY TO TELL DEVELOPMENT!



Here at Lindberg, engineers and technicians have been working for months on a development that we believe is one of the most important in the industrial furnace field. We can't tell you all about it until September but we are so sure that it is important news to everyone working with metal that we are giving this advance notice of what's coming from Lindberg. Look for the announcement in September trade papers or, if you're in Chicago September 6 to 16 for the big shows, arrange to see this development at one of the special showings in our plant.

We are planning a series of showings of this new development at our plant during the period of the three Chicago Shows, September 6 to 16. If you are in Chicago, phone MOnroe 6-3443 and we'll make arrangements for your attendance at one of these showings.

**LINDBERG ENGINEERING COMPANY**

2447 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 Regentview Ave., at Downey, California

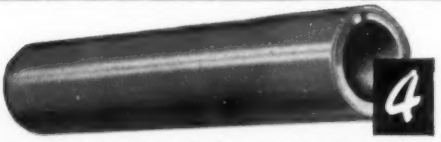
Company, Ltd., Weybridge, Surrey, England • Etablissements Jean Aubé, Paris • Lindberg Industrie Ofenbau, Gross Auheim, Germany

# 7 WAYS to SAVE MONEY with TOCCO* Induction Hardening

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½c saved on every piece — $47.50 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.

Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of $375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from $1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.




Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from $5.45 to $3.25 per hundred parts—a savings of 2c per pin, $26.40 per production hour.

Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.

7 Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

**THE OHIO CRANKSHAFT COMPANY**

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-8, Cleveland 1, Ohio
Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

### Officers

H. B. **Osborn, Jr.**
*President*
Cleveland, Ohio

Howard C. **McMillen**
*Vice-President*
Bedford, Ind.

Harold E. **Collins**
*Vice-President*
Houston, Texas

Raymond C. W. **Peterson**
*Vice-President*
Toledo, Ohio

Wayne **Ewing**
*Vice-President*
Los Angeles, Calif.

Harold Dale **Long**
*Treasurer*
Chicago, Ill.

John X. **Ryneska**
*Secretary*
Lynn, Mass.

Harry E. **Conrad**
*Executive Secretary*
Detroit, Mich.

Allan Ray **Putnam**
*Asst. Executive Secretary*
Detroit, Mich.

### Board of Directors

H. B. **Osborn, Jr.**, *Chairman*
Cleveland, Ohio

A. B. **Clark**
Cleveland, Ohio

H. E. **Collins**
Houston, Texas

J. P. **Crosby**
Lexington, Mass.

W. G. **Ehrhardt**
St. Louis, Mo.

Wayne **Ewing**
Los Angeles, Calif.

G. A. **Goodwin**
Dayton, Ohio

Ben J. **Hazewinkel**
South Gate, Calif.

J. O. **Horne**
Rochester, N. Y.

H. Dale **Long**
Chicago, Ill.

H. C. **McMillen**
Bedford, Ind.

G. A. **Rogers**
Montreal, Quebec

C. M. **Smillie**
Detroit, Mich.

R. A. **Smith**
W. Hartford, Conn.

### Editorial Committee

Joseph L. **Petz**, *Chairman*
Poughkeepsie, N. Y.

Gustave B. **Berlien**,
*Vice-Chairman*
Oakland, Calif.

Lee M. **Davis**
Springfield, Vt.

Harold W. **Hagle**
Wesleyville, Pa.

Ralph F. **Mueller**
St. Louis, Mo.

Donald E. **Wernz**
Baltimore, Md.

Donald E. **Zierk**
Dundee, Ill.


# The Tool Engineer

## Help Wanted

These two words "Help Wanted," as they continue to appear daily in our newspapers and other publications, are the most convincing proof anyone needs to be assured that the over-all employment picture in this country is excellent. There may be chronic conditions of unemployment in a given industry or area, but it is highly improbable that we can have any national unemployment develop even for a short period of time. This situation has evolved from natural causes, all of which result in having an insufficient number of man-hours available for the jobs which have to be done.

These effects are inherent in an economy which has brought about an increase in our standard of living and enabled more people to have more time to enjoy it. The working population of our country is not increasing fast enough; that is, not in the necessary proportion to the increase in population generally. Why aren't they working? That answer is simple. Not only has there been a big gain in college enrollment (more families can afford it) but the number of pupils in our high schools keeps increasing out of proportion to the population growth. An additional loss is the result of more pension plans taking effect. Further, shorter working hours compared to many years ago, and an apparent trend to shorten these still more, adds to the problem.

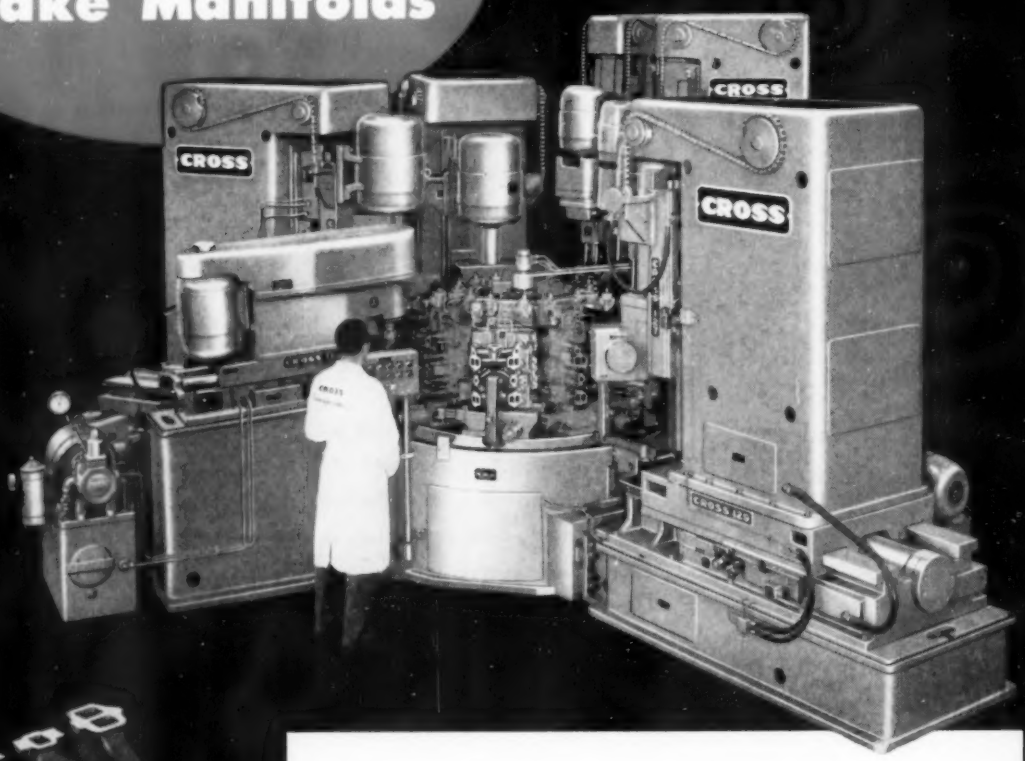
What is the answer? There is only one in our American way of life —that is increase productivity. We must conserve our man-hours and get the most from them. To do this requires an even greater increase in invested capital to provide the facilities and the equipment. American industries are accepting this challenge and, with the proper guidance and counseling of the tool engineering profession, the job can be done quickly and effectively—thus providing the greatest economic stability and security this country has ever known.

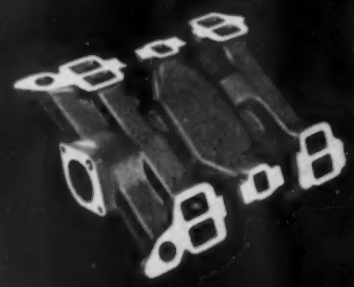
H. B. Osborn Jr.

**PRESIDENT**
**1955-56**

# Mills and Drills 2 and 4 Barrel Intake Manifolds

*Another Special by Cross*



- ★ Rough and finish mills mounting faces; mills, drills and chamfers water outlet pad.
- ★ 145 pieces per hour at 100% efficiency.
- ★ 7 stations: 1 loading, 4 milling, 1 drilling and 1 chamfering.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Automatic retraction for milling cutters.
- ★ Cross-Drive for milling cutters.
- ★ Pre-set tooling throughout.
- ★ Gravity operated cam clamping for indexing table.
- ★ Other features: Hardened and ground ways; hydraulic feed and rapid traverse; complete interchangeability of all standard and special parts for easy maintenance; Construction to J.I.C. standards.

*See us in Booth No. 1118 at the Machine Tool Show*

*Established 1898*

THE CROSS CO.

DETROIT 7, MICHIGAN

*Special* MACHINE TOOLS

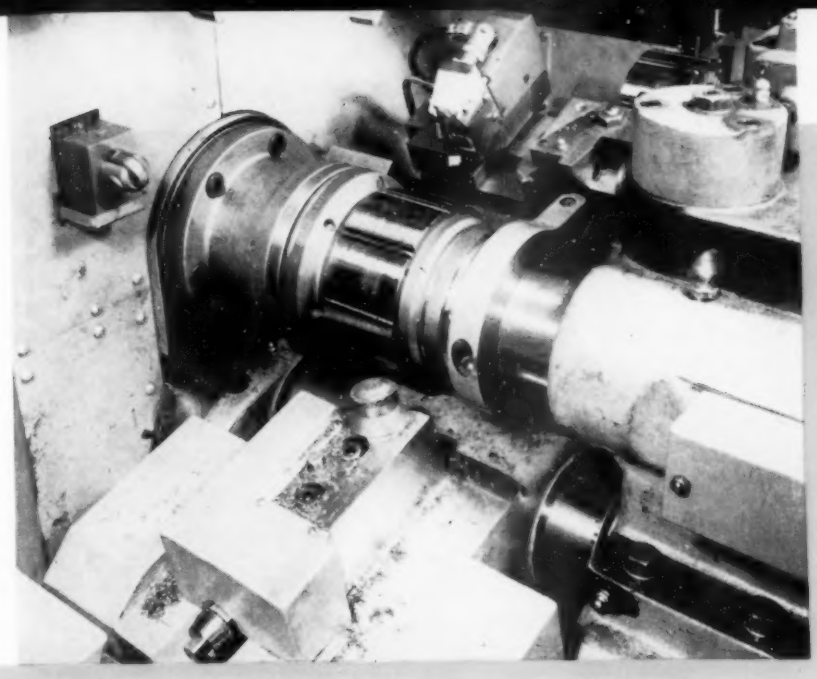


**Fig. 1. Close-up view of automatic lathe tooling showing gage mounted on back arm carrying chamfering tools. Turning tool is a circular carbide disk having its infeed and cutting edge positioned by the machine controls.**

# parts produced to size by automatic quality control

**By David N. Smith**

**Manager of Research**
**Jones & Lamson Machine Co.**
**Springfield, Vt.**

SETTING UP an automatic regulating system to satisfactorily produce piece parts within tolerances becomes involved. The controls must recognize the difference between normal dimensional variations as distinct from drift in machine output. Automatic gaging for the purpose of classifying and sorting pieces according to dimension is nothing new. For many years, the ball bearing industry has been sorting balls and raceways for the purpose of selective assembly. The automotive industry has been gaging pistons, cylinder blocks and bores for the same purpose. Automatic measuring of piece parts is a well established technique.

In the control of continuous processes, such as in the petroleum industry and in the chemical industry, techniques of measurement and regulation have also been well established for many years. In such control systems the measurement of the output is used to regulate the input in order to maintain the desired characteristics of the product.

This use of the measurement of output to adjust input is what control engineers call "feedback." It is this feature of feedback that has been incorporated into the regulating system of the Fay lathe illustrated in *Figs.* 1 and 2. Feedback control is employed in order that the gaged dimension of the workpiece may be used to regulate tool setting properly.

The application for this lathe involves turning the outside diameter of electric motor stators and chamfering the ends. The machine is completely automatic. Its features include automatic handling of workpieces; automatic chip disposal; automatic gaging of the finished diameter of the workpieces; sorting of the workpieces according to good, oversize or undersize classifications on the delivery side of the machine; and automatic adjustment of the tool to compensate for tool wear and maintain finished diameter size.

Workpieces are handled by two automatic transfer arms on an overhead carrier. The back arm picks up incoming pieces and places them onto the fixture. The front arm picks up the finished workpieces and deposits them on a classifying conveyor in front of the machine. This delivery conveyor

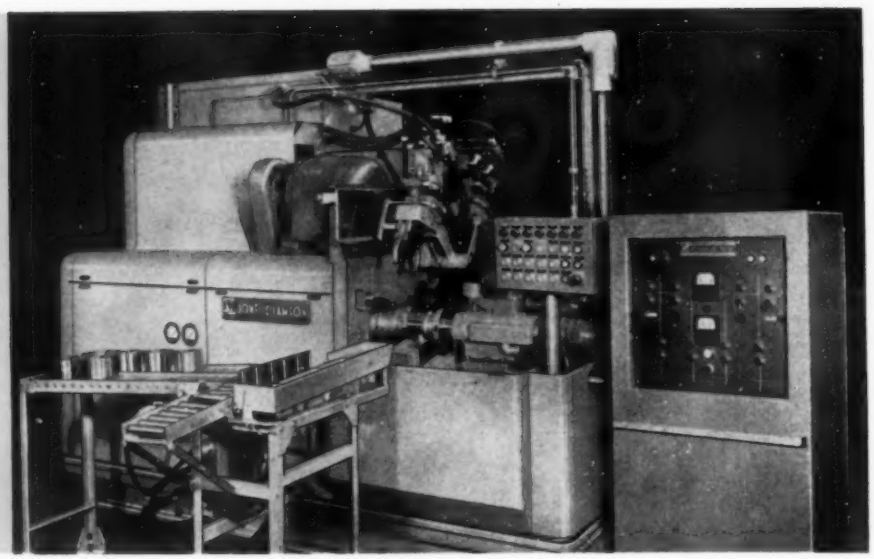


**Fig. 2. Completely automatic lathe utilizes statistical methods for controlling its production.**

consists of three sections: one for oversize, one for undersize and one for good pieces. The conveyor sections for out-of-tolerance parts lie parallel to the machine. The section for good pieces comes out the front of the conveyor, passing the parts to the next operation. Sorting is accomplished by trapping the pieces at the appropriate spot so that a roll-over station on the delivery conveyor can deposit them into the proper one of the three sections.

Workpieces are held in the machine on an expanding arbor, clamped endwise by a tailstock ram. They are turned by a front carriage tool. *Fig.* 1 shows a close-up of the work area of the machine with a piece in place which has just been finish turned and chamfered.

The turning tool is a flat disk of carbide 1¼ inches in diameter. It is adjustable in two manners. It can be moved radially in and out from the workpiece through a total range of 0.0020 inch by steps of 0.0002 inch. It can also be rotated in 100 steps so as to use the entire periphery for the cutting edge. A constant-rise cam adjusts the in-and-out position of the tool. It is rotated in either direction by solenoids and has ten steps per revolution. Rotation of the tool bit is also accomplished by a rotary solenoid through a worm-and-gear drive to the tool post on which the tool is mounted.

After the entire circumference of the tool insert has been used, the machine automatically stops and an indicator light calls for a new tool. Another insert is installed by removing the top screw on the tool post and either turning the tool over to use the other face or replacing it with a new tool.

The gage head for measuring the workpiece is visible in the upper part of *Fig.* 1. This head is carried on the back arm of the lathe which also carries the chamfering tools. These tools are rocked in at the end of the turning cut. After they have finished the chamfering cut and during the moment of dwell, the gage head is energized and takes a size reading of the finished turned piece. This is done without touching the piece while it is still rotating. The gage, in effect, measures a nominal five-thousandth air gap magnetically. It is a proximity gage, its circuits being sufficiently damped so that the effect of the slots in the workpiece is compensated. All of the components necessary on the machine for automatically gaging and automatically adjusting tool position to compensate for tool wear are shown in *Fig.* 1.

## Provides Normal Deviations

The problem of compensating for tool wear and other factors causing drift stems from the fact that normal deviations are being measured in each piece. As in any process of this sort, pieces are not exactly alike from one piece to the next. In the process of turning, as in all similar processes, there is some dimensional variation from piece to piece which is inherent in the machine, in the tooling and in the motions which control the entire operation. This variation from piece to piece is what the statistical engineer characterizes as "normal dispersion." It is necessary that any gaging and regulating system recognize this normal dispersion and ignore it. It must react only to a drift out of dimension due to such causes as tool wear, machine temperature changes and other slow effects that are distinct from this "piece-to-piece" scatter of dimension.

Failure to recognize and accommodate this dispersion would result in the regulating system trying to correct for the deviation of *each* piece from the median line which would *increase* the scatter of dimension due to the hunting effect of the regulating system.

With this requirement in mind, specifications

can be set up for a proper gaging and regulating system. *Fig.* 3 shows pictorially the approach to the problem. The first requirement for a successful system is that the machine be able to produce consistently within dimensions when left unregulated. In other words, it should be able to run at least forty or fifty pieces without any machine adjustments yet have the total spread of dimension well within the allowed tolerance. In fact, the total dispersion of such a test run should not be more than one-half of the total allowed tolerance. This is a basic requirement and must not be overlooked. Until the machine can produce that order of repeatability there is no gain to be realized from adding regulating features.

### Divides Tolerances into Zones

After this process capability is established, the total tolerance can be divided into zones. Referring to *Fig.* 3, a narrow zone in the middle, indicated as Zone A, includes almost all of the normal dispersion curve, leaving only a small percentage at each tail end where a piece with a larger or smaller diameter than in the middle of the zone will occasionally be found. These are still good pieces. The zone boundaries are established by contact meters. Going back to *Fig.* 2, these contact meters can be seen on the gage indication panel on the right side of the picture.

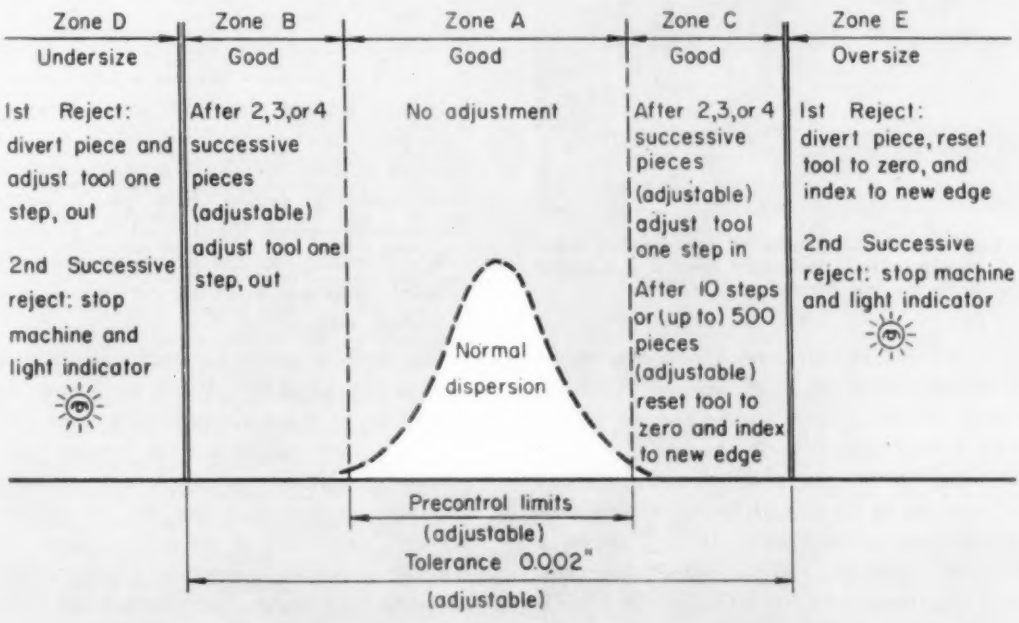
Current output from the gage system is applied to both meters and the contacts of one meter are set at the narrow or "precontrol" limits. The contacts of the other meter are set to the maximum allowed tolerance. When a piece is gaged, the current output to the meters will indicate the zone in which that particular piece falls—in midzone A, marginal zone B or C, or reject zone D or E.

Normally pieces will fall in Zone A and no tool adjustment is required. Occasionally, a piece will fall in Zone B or C because there is a calculated probability on the basis of the normal dispersion curve and the setting of the precontrol limits that this will happen once in a while. When this occurs, it is recorded on a relay storage system in the main electrical panel. No adjustment, however, is called for on the basis of this first piece. If the next piece gaged falls in Zone A, the relay memory is erased and the slate is cleared for the next operation. However, if the second successive piece gaged after the first measurement in Zone C or Zone B is also in that same zone, then the calculated probability of a shift or trend in dimension is so high that the system calls for one increment of tool adjustment in or out depending on the zone in which the measurement fell.

By this means a "statistical intelligence" is established in the system which can distinguish the difference between normal dispersion and the high precalculated probability of a shift in one direction or the other. The use of these narrow limits inside the total allowed tolerance also gives sufficient anticipation of going out of allowed tolerance so that scrap is avoided except in the case of an accident.

Such an accident might, for instance, result from

**Fig. 3. Machine control uses principal of statistical dispersion. Tolerance limits and precontrol limits are set to the desired positions and electrical circuits discriminate between normal deviations and drift.**


Zone D
Undersize
1st Reject: divert piece and adjust tool one step, out
2nd Successive reject: stop machine and light indicator
Zone B
Good
After 2,3,or 4 successive pieces (adjustable) adjust tool one step, out
Zone A
Good
No adjustment
Normal dispersion
Zone C
Good
After 2,3,or 4 successive pieces (adjustable) adjust tool one step in
After 10 steps or (up to) 500 pieces (adjustable) reset tool to zero and index to new edge
Zone E
Oversize
1st Reject: divert piece, reset tool to zero, and index to new edge
2nd Successive reject: stop machine and light indicator
Precontrol limits
(adjustable)
Tolerance 0.002"
(adjustable)

a sudden chip-out on the cutting edge of the tool. This would result in producing an oversize piece. The gaging system would then indicate that the measurement of that piece fell in Zone E. The first such oversize piece would result in the sorting conveyor rejecting the piece into the oversize chute, automatically resetting the tool to zero from whatever in-and-out position it may be and indexing it to a new part of the cutting edge. This would be the most obvious action to take because the probability of suddenly producing an oversize piece is almost entirely due to chip-out of the cutting edge.

The machine then recycles to make a second piece. If that second piece falls within the acceptable zone the machine operation continues. However, if the second piece is also oversize, the machine shuts off and an indication of the cause of shutdown appears on the operator's panel.

## Automatically Adjusts for Undersize Parts

In the event of suddenly producing an undersize piece there is no obvious action to be taken, except to divert the piece into the undersize chute and adjust the tool one step outward. A second piece is made and if it falls within the allowed tolerance the machine cycle continues. But, if it is also undersize, the machine stops and an indication of the cause of shutdown appears on the main panel.

Thus, the first requirement is met, i.e., that the system be able to take corrective action *only* in the case of indicated drift out of dimension. A second requirement which is basic to the success of the operation is that the size of the correction be properly related to the rate at which the dimension may be expected to go out of limits, in this case the expected rate of tool wear. *Fig.* 4 shows a process chart indicating piece-to-piece measurement on a dimension which is experiencing a slow shift toward the upper tolerance limit.

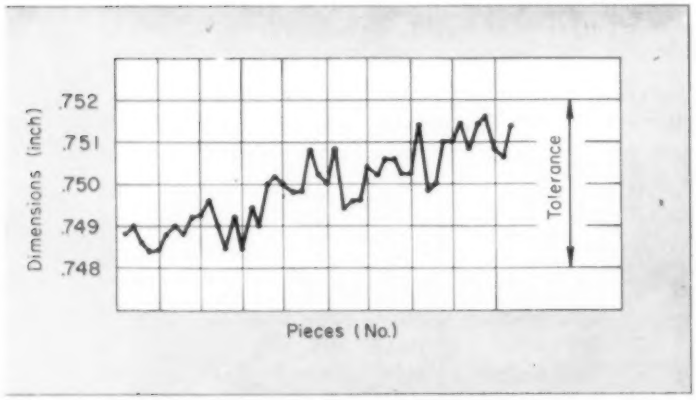



**Fig. 4. Log of measurements of consecutive piece parts. A steady drift is indicated toward the upper tolerance limit, calling for machine adjustment.**

Since the tool setting is adjusted by fixed increments, in this case 0.0002 inch radially over a total range of 0.0020 inch, the expected rate of tool wear must be determined before the regulating system is put into operation. This must be done on any such process in order to relate the size of the correction increment to the rate of process shift. The increment must be large enough so it can comfortably keep up with the trend but must not be so large as to throw the process out of limits in the opposite direction.

Requirements may be summed up generally as follows: In the first place the machine must be able to produce consistently within a total dispersion of about half the allowed tolerance when it is left in operation over a run of forty or fifty pieces without adjustment. Secondly, the narrow limits or precontrol limits must be set in proper relation to the spread of the normal dispersion curve. The narrow limits must be calculated so that two successive pieces in either marginal zone will indicate a high probability of shift as distinct from dispersion. In other words, when properly set the chances of two successive pieces in a marginal zone are only about 1 to 200 unless the process is undergoing a shift. And last, because the tool is adjusted by fixed increments, the size of the increment must be determined by the established rate at which the process may experience drift. This must be determined in advance in order to establish the proper size increment.

## Achieves Continuous Control

When these several requirements have all been met and the system is correctly designed to the nature of the process, a regulating device can control the process on a proper statistical basis. It permits operation in a manner closely approaching that of a continuous process control even though it is built around individual measurements of discrete piece parts. It makes possible the distinction between scatter, which is expected and must be accommodated, versus drift which is the only characteristic which should call for process adjustment. It anticipates the process going outside the allowed limits and institutes corrections in advance of making scrap.

The only occasion for scrap is some accident such as tool breakage. While the system discussed makes use of magnetic proximity gage circuits, it can be equally effective with contact gaging, air gaging, off-machine gaging or on-machine gaging. The basic system and the use of narrow limits properly set relative to the process capability make possible a proper regulating system wherever an adequate measurement of dimensional characteristics can be made.

# Gadgets

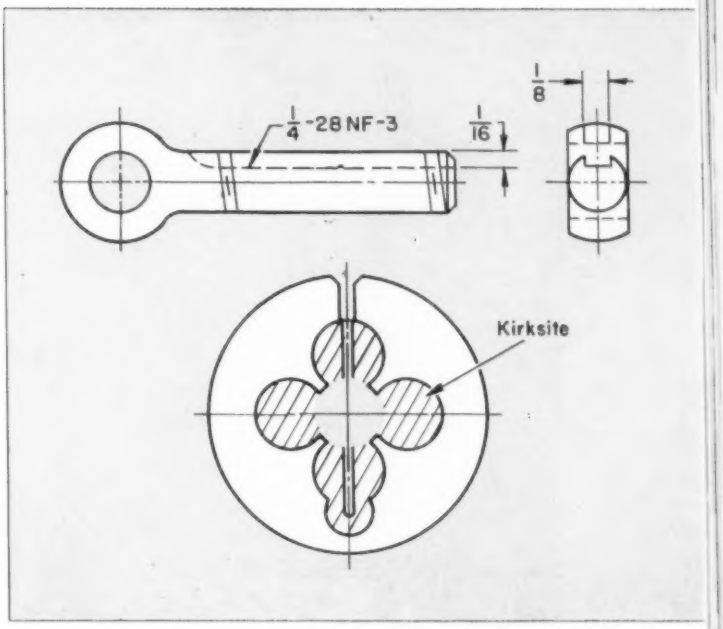
Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

## Deburring Die

Deburring the eyebolt shown in the sketch presented a rather difficult problem, because the 1/8-inch slot was milled after the bolt had already been threaded. Since the usual button die has four cutting edges smaller than the slot, it was not practical for the purpose. Whenever the bolt was started through such a die the cutting edges would "hang up" in the slots.

The problem was eliminated by the following means: Kirksite was poured in the shaded area of a die, according to the sketch, around an unslotted bolt which was screwed into the die. After the die cooled the bolt was removed and the die was slotted. Thus a solid die was produced. This solved the deburring problem as it is possible with this die to screw the bolts in and out without difficulty.

*Klaus L. Schlesinger*
*Los Angeles Chapter*



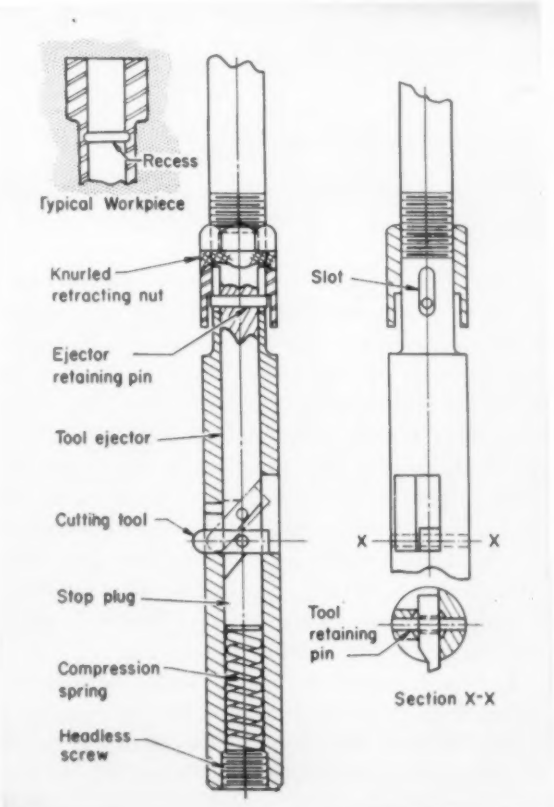

## Recessing Tool

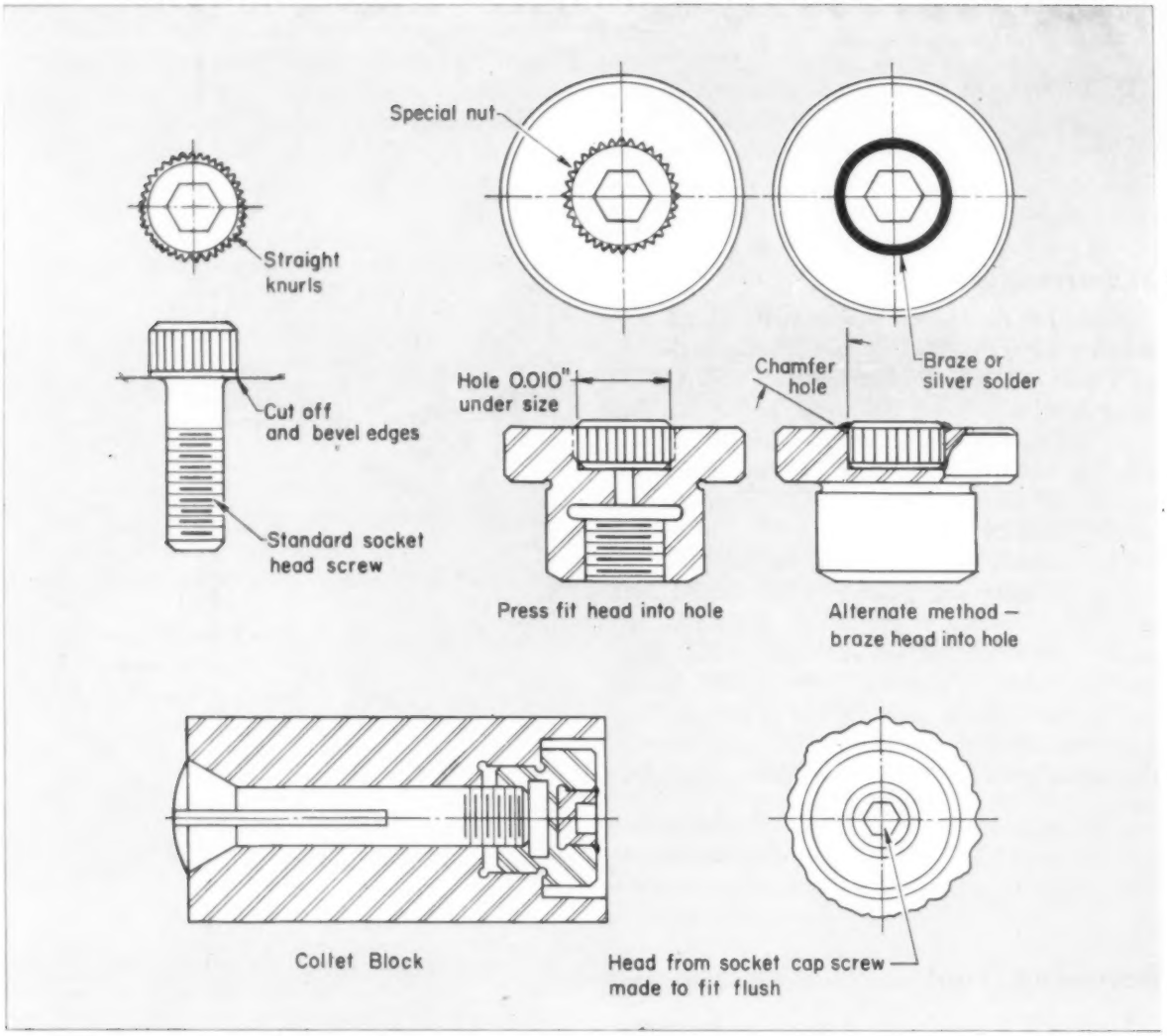
Frequently in machining a recess in a machine part it is necessary to design a recessing tool in which the cutting tool is retracted until it reaches the cutting area. This problem is often encountered when the recess is too deep to reach with a boring tool. An example of such a part is shown in the accompanying sketch.

To meet such situations a recessing tool with a simple, yet positive, action was designed. As shown in the sectional view, the cutting tool can be retracted by turning the knurled nut which allows the ejector retaining pin to move in the slot provided for that purpose. A bevel on the tool ejector and stop plug forces the cutting tool to move back at an angle so that it can be contained in the outside shell of the tool.

A compression spring causes the stop plug and tool ejector to move when the retracting nut is turned. A retaining pin holds the cutting tool in place but permits it to rotate about the pin in order to retract into the tool. By providing different sizes and shapes of cutting tools, this device can be used for a variety of cuts.

*D. Sweet*
*Marblehead, Mass.*




Special nut
Straight knurls
Cut off and bevel edges
Standard socket head screw
Hole 0.010" under size
Chamfer hole
Braze or silver solder
Press fit head into hole
Alternate method — braze head into hole
Collet Block
Head from socket cap screw made to fit flush

## Socket Heads for Special Fasteners

Often a tool designer would like to incorporate a recessed socket head into the design of a special screw or nut which is to be used in a jig, fixture or special piece of machinery. Machining of such a blind hexagon opening is difficult without special equipment for the purpose, which the small shop is usually lacking. However, the head can be made rather simply from a standard recessed socket cap screw. Such specials can be made up economically by the method described. Many such items have been used in the shop and none has failed in service if properly made. There are two methods which may be used for the adaptation.

The head of a socket cap screw of suitable size is sawed off. The type of head with a straight knurl around its periphery is best. The knurl will act as a broach to cut its own splines when it is pressed into a bored hole 0.010 to 0.015 inch smaller than the OD of the socket screw head. This allowance will vary somewhat according to the size of the screw selected. It is usually necessary to chamfer the bottom of the head enough to remove the unknurled portion. The purpose of this is to cause the serrations to cut cleanly as the head is pressed in.

In some cases it will be found more practical to braze or sweat with silver solder than to make a press fit. For this second type the hole is bored to proper size for a light drive fit. The recess is then filled in with braze or silver solder as shown in the accompanying sketch. The screw head, of course, loses some of its hardness when subjected to the heat of brazing and will therefore be less wear resistant than if the first method is used.

*H. J. Gerber*
*Member-at-Large*
*Stillwater, Okla.*

## Cutoff Device

When cutting a number of sections in a lathe from bar stock held in a draw chuck, satisfactory results are often difficult to obtain if the sections must be equal in length and have good finish upon the ends. Resetting the work by scale measurement after each cutoff wastes time and is rather inaccurate. The work often requires trimming later on to obtain exact length and finish.

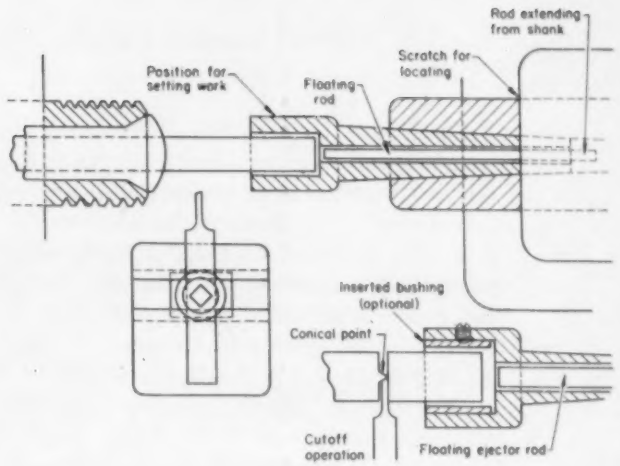
The method illustrated can produce an indefinite number of pieces of equal length and of good finish upon the ends. It holds the work steady and straight until the end of the cut, preventing premature break-off, which would leave an objectionable point. It also prevents cramping of the cutoff tool.

The fixture is tapered at one end to fit the tailstock of a lathe and, on the other end, is bored slightly larger than the diameter of the work.

In operation, the stock is first clamped with its end projecting a convenient distance; the tailstock with the fixture inserted is moved forward to a position where the bottom of the bored hole can be advanced to butt against the end of the projecting stock. The tailstock quill must extend far enough to allow it to be withdrawn later for the ejection of the cutoff work. The tailstock is then clamped in place. When the fixture is in position with the hole bottom in contact with the work, a record of this location is made to set the work for additional cuts.

Having set the work, the fixture is drawn out of the way and the cutoff tool is set to cut off the first piece exactly of the right length. The tool carriage is then locked in place and the fixture advanced until the bored hole partly covers the extended stock. After cutting off the first piece, the lathe carriage may be shifted slightly to adjust for length.

To get a smooth and clean cutoff, the cutting end of the tool is ground at an angle. The piece




is first severed and the conical point remaining is removed by the advancing tool, thus leaving a smooth end upon the work.

To reset for another cutoff, the quill is advanced to the recorded position and the work is fed forward until stopped at the bottom of the bored hole. The stock is then clamped and operations proceed as in the first cutoff.

To facilitate ejection of the work from the fixture, a small rod floats in a hole drilled through the fixture. If the rod is of the right length, it will not interfere with the setting of the work but will eject the work by its contact with the tailstock screw when the quill is withdrawn.

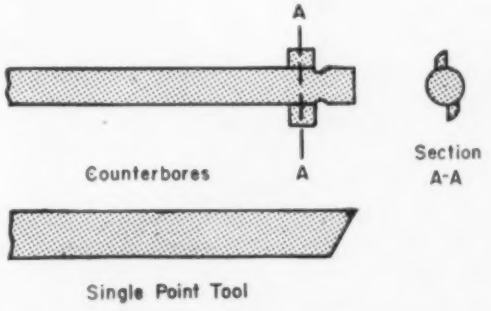
This fixture is equally useful in cutting off lengths of tubing. By holding the tube steady and straight during the cut, it avoids tearing at the end of the cut. The fixture may be adapted to cutting off a variety of sizes of rods or tubes by fitting bushings into it, one for each size.

*Frank E. Chace*
*Pawtucket, R. I.*

## Special Cutting Tools

To make odd-sized or extra-length counterbores for one-of-a-kind jobs, the cost of conventional tools is excessive. A serviceable substitute can be readily made by using a cold rolled rod of the pilot diameter and building up two lumps of hard facing metal with acetylene torch. The bits are then ground to size and shape freehand. The faces are backed off and undercut with the hand grinder, as shown in the accompanying illustration.

Extra-long lathe, shaper or planer tools can be made the same way by welding on a Stellite corner. A piece the size of a match



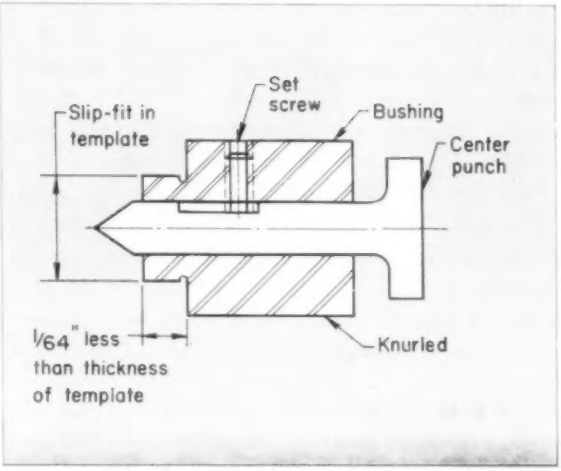

head is sufficient. The cutting edge can also be built up by arc welding but the torch application is preferable.

*John A. Blaker*
*Auburn, Mass.*

## Guided Center-Punch

Designed to lengthen life of sheet metal layout templates and to achieve higher accuracy, this tool can be adapted to other similar jobs. Its construction is simple. As shown in the illustration it consists of a hardened bushing, a hardened center-punch and a setscrew for retaining the punch. The punch is slotted to permit it to slide, though retained in the bushing by the setscrew. The bushing is made a slip fit for the standard size holes of the templates. Greater accuracy is secured than with conventional tools as the flange on the bushing assures squareness of the center-punch with the template.

*Fred D. Biddle*
*Philadelphia Chapter*



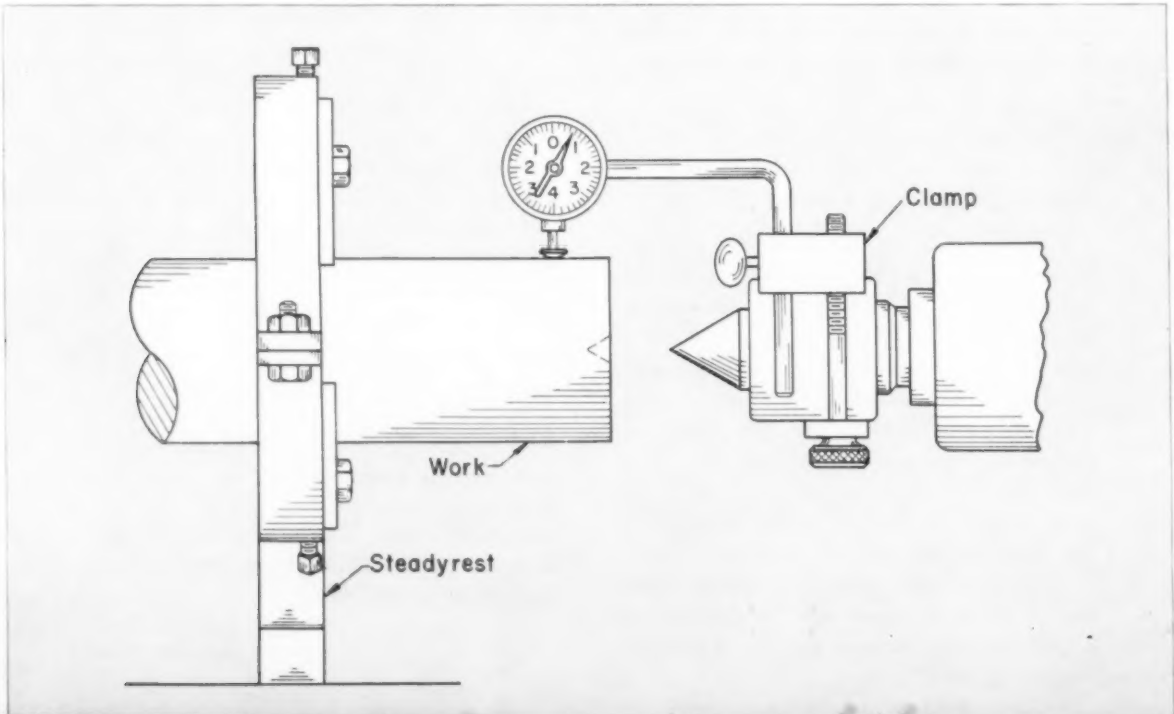

## Setup Indicator for Bar Stock

When setting up a length of bar stock in the steady rest of a lathe, the usual procedure for lining it up on center is to indicate the shaft close to the chuck until it is centered. Then the indicator is run along the top of the bar and the steadyrest is adjusted until the top of the bar is parallel to the bed. Then the front edge is indicated to get it parallel to the bed in the vertical plane. However, any adjustment made in this plane may throw the centerline out of the horizontal plane, requiring further adjustment. As a result this is a time-consuming operation.

To simplify such setups the device shown in the accompanying illustration was developed. It consists of a clamp to mount an indicator on the ball-bearing center. Using this the bar is centered by rotating the indicator about the end of the bar while the steadyrest is adjusted.

The clamp is easily made and has proved a great time saver. The same procedure can be followed for an occasional job by means of an improvised arrangement employing standard parallel clamps.

*Henry Koslow*
*Bronx, N. Y.*



# putting machinability data to work

**By M. C. Shaw, N. H. Cook and P. A. Smith***
**Machine Tool Div., Mechanical Engineering Dept.**
**Massachusetts Institute of Technology**
**Cambridge, Mass.**

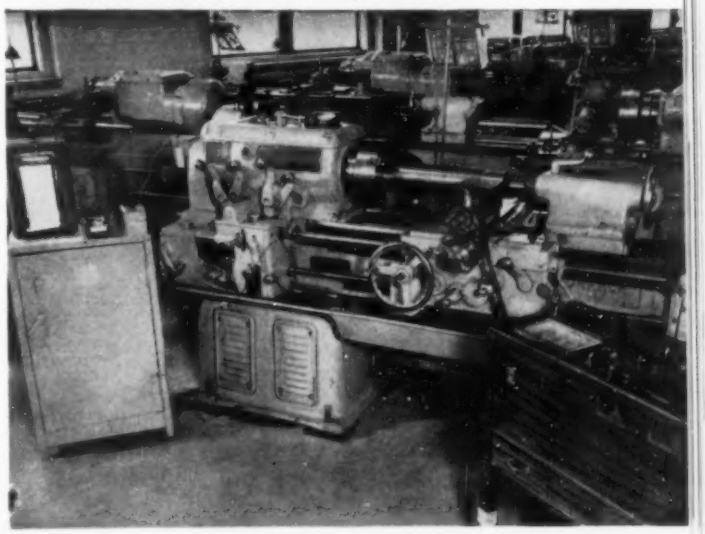
MACHINABILITY MEANS DIFFERENT THINGS to different people. Some of the meanings that have been attached to the term include: (1) relative life of a cutting tool or relative rate of tool wear; (2) relative finish produced under similar tool geometry and feed; (3) relative value of cutting force or relative energy required to produce a unit volume of chips of a given size. All of these things are of legitimate interest to the tool engineer, but under certain circumstances one may be more important than another.

For instance, in roughing operations tool wear will usually be the most important, unless an underpowered machine must be used, when cutting force will come into the picture. In finishing operations finish produced will generally be the most important consideration and tool life may assume a secondary, although still significant role.

These multiple definitions of machinability have caused much confusion in the past. While the three quantities listed are all important, tthey are not directly related and cannot be used interchangeably. For example, the measurement of cutting force, *Fig.* 1, while it provides useful data, is a poor way to measure tool life. Tool life involves wear and a wear test must, in general, be used to study a wear process. Yet no correlation has been found in the past between noncutting laboratory wear tests involving sliding surfaces and the wear on a cutting tool. Apparently the wear test investigated must involve the generation of a clean surface and there appears to be no substitute for the cutting process itself.

Similarly, a relative picture of tool wear should not be used to infer the tendency of a metal to produce fine finish. Actually, in many instances it is found that poor finish accompanies good tool life and vice versa. Thus, to evaluate the inherent ability of a metal to give a smooth surface, the cut must be made under different conditions so the finish obtained can be observed. While all of this may seem basic, the extent of the difficulty that can arise from failure to put these concepts into practice is

**Fig. 1. Setup in machine tool laboratory at MIT for measuring cutting forces and temperatures.**



*Senior member ASTE Boston Chapter.

Based on a discussion given at the 1955 ASTE Regional Conference, Massachusetts Institute of Technology.

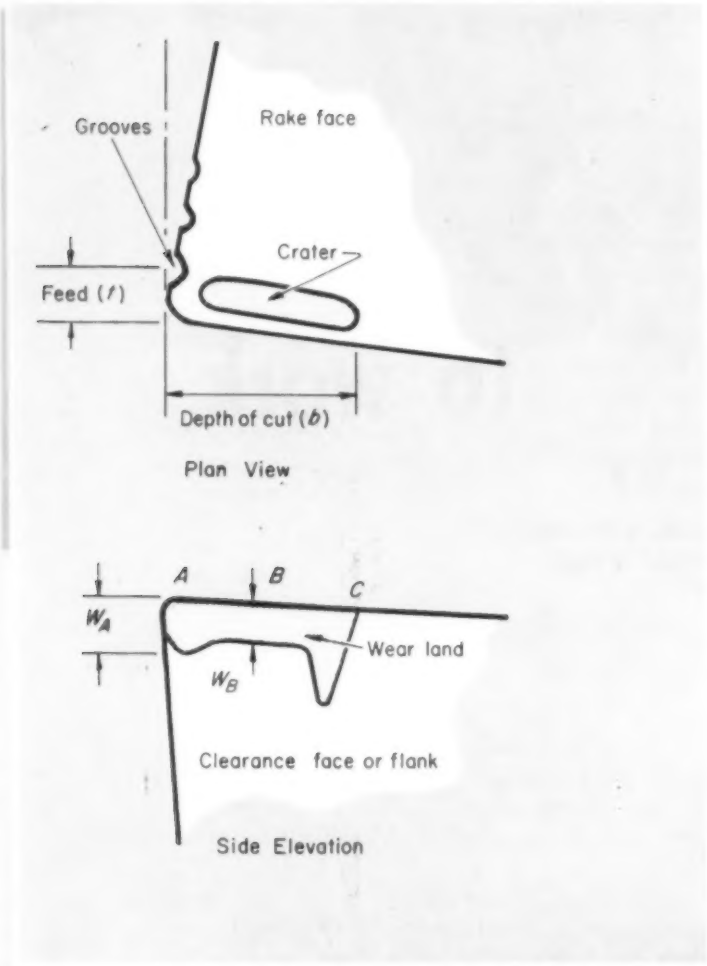



**Fig. 2. Regions of wear on a carbide cutting tool.**

surprisingly complicated and involved.

The first question that might be asked is how tool life-machinability should best be expressed. Essentially the answer was given by F. W. Taylor fifty years ago.[1] He recognized that it is not really a long tool life that is desired but rather minimum cost per part. He recognized cutting speed, $V$, as the single most important variable that influences tool life. Knowing that the cutting speed determines the time it takes to produce a part, he decided to rate the machinability of steels in terms of the speed at which they could be cut to give a 20-minute tool life, $V_{20}$. Thus, if $V_{20}$ for steel $X$ were found to be 100 fpm, while that steel $Z$ were 150 fpm, then he said the rating of steel $Z$ compared with $X$ was $V_{20(Z)}/V_{20(X)} = 1.5$.

Now, what Tylor should have done was to determine the cost in cents to produce a given part from steels $X$ and $Z$ under conditions to give minimum cost per part. The ratio of these two costs, $¢x/¢z$, would then represent the most important machinability index possible. It can be shown by a relatively simple analysis that this ratio of costs is a good approximation of Taylor's ratio. The only improvement that might now be suggested is that a two-hour tool life ratio could be substituted for the 20-minute tool life ratio, since a two-hour tool life is closer to the value that should be used to obtain minimum cost. Thus, if a group of steels or a group of cutting fluids or a group of tools is to be compared from the standpoint of tool life, the comparison should be made by comparing the speeds corresponding to a two-hour tool life.

In considering the relative finishability of a group of steels, fluids or tools, there is no criterion that is comparable to the cutting speed to give a two-hour tool life. The only things one finds in metalworking literature concerning the tendency for a steel to produce good or poor finish are vague statements to the effect that the steel has a strong tendency to form a built-up edge or that it is stringy or has a tendency to be draggy and the like. A good quantitative measure of the tendency for a cutting combination to produce good finish is sorely needed.

The criterion of cutting force machinability is the energy per unit volume, $u$, which can readily be measured in the laboratory with a dynamometer or estimated from existing rules based on past experience. It is interesting to note that, unlike tool life, energy per unit volume usually is independent of cutting speed.

## Tool Wear

The question of how tool life should be defined or recognized in a tool is extremely important. Taylor chose complete breakdown in his tests on HSS tools and from the evidence this appears to have been a good choice.

In the case of carbide tools the question is more complex and it has been customary to study and record the development of wear areas on the tool faces rather than to operate the tools to complete failure. This is because it is so much more costly to grind carbide tools than HSS tools.

When the included tool angle of carbide tools is too small, the cutting force too high, the carbide too hard and brittle or if the tool is subjected to undue shock, large-scale chipping or breakage may result. However, when this occurs, the cause is usually easily uncovered and corrected. Similarly, if the tool temperature is too high, this can be recognized by the unusual conditions at failure. The obvious solution is to decrease the cutting speed. The more normal and persistent type of tool wear is a gradual one that progresses more or less uniformly.

The manner in which wear markings frequently develop on a carbide tool is shown in *Fig.* 2. There are three regions in which wear scars are to be found.

[1]References are listed at the end of the article.

1. The crater on the rake face of the tool
2. The flat area that develops on the tool flank (called the wear land)
3. Grooves along the secondary cutting edge.

All of these conditions are not always present. Frequently the grooves along the secondary cutting edge are not observed. The greatest volume rate of wear is usually associated with the crater and for this reason it might be considered to be the controlling region. Unless the crater is unusually large, however, it does not extend to the cutting edge up to the time the tool is taken from service. When the crater does become so large that the entire tip of the tool breaks off during use, due to the weakening effect of the crater, it is an indication that the wrong carbide is being used or that the cutting speed is high. It would thus appear justified to record the development of the wear land on the tool flank in following the deterioration of a carbide tool.

The next question that arises is what point on the wear land should be followed, that at *A*, *B*, or *C* in *Fig.* 2. Frequently the amount of wear in region *C* is greatest even though it is the region of lowest temperature along the cutting edge and is subjected to the least compressive stress. Since the formation of wear particles involves the brittle fracture of minute areas on the tool following the formation of welded junctures between chip and tool, it may well be that it is the lack of hydrostatic pressure and temperature in the vicinity of *C* that promotes a high wear rate in this particular region.

While a large groove at *C* may require more grinding to recondition the tool, the nature of this groove is such that it does not endanger the entire cutting edge nor does it adversely affect the finish. So it would seem that region *C* should be ignored in following the rate of tool wear. If, however, two different tool materials give the same values of life, it would be advantageous to use that tool having the smallest groove at *C*, since this would be the one which could be reconditioned at the least cost.

Usually a tool will chip or otherwise fail rapidly when the wear land in regions *A* or *B* reaches a certain value. Since failure usually occurs at *A* or *B*, depending on which is larger, it can be assumed that the quantity to be followed in wear studies of a carbide tool is the size of the wear land at *A* ($w_A$) or at *B* ($w_B$), whichever is the larger.

When tools are tested in the laboratory at different speeds, curves such as those shown in *Fig.* 3 are generally observed. As shown in the diagram, *L* is the helical length traveled by the tool over the workpieces. The relation between helical length and the cutting length measured along the axis of the bar in feet is:

$$L = \frac{\pi d}{t} l_a P \qquad (1)$$

where

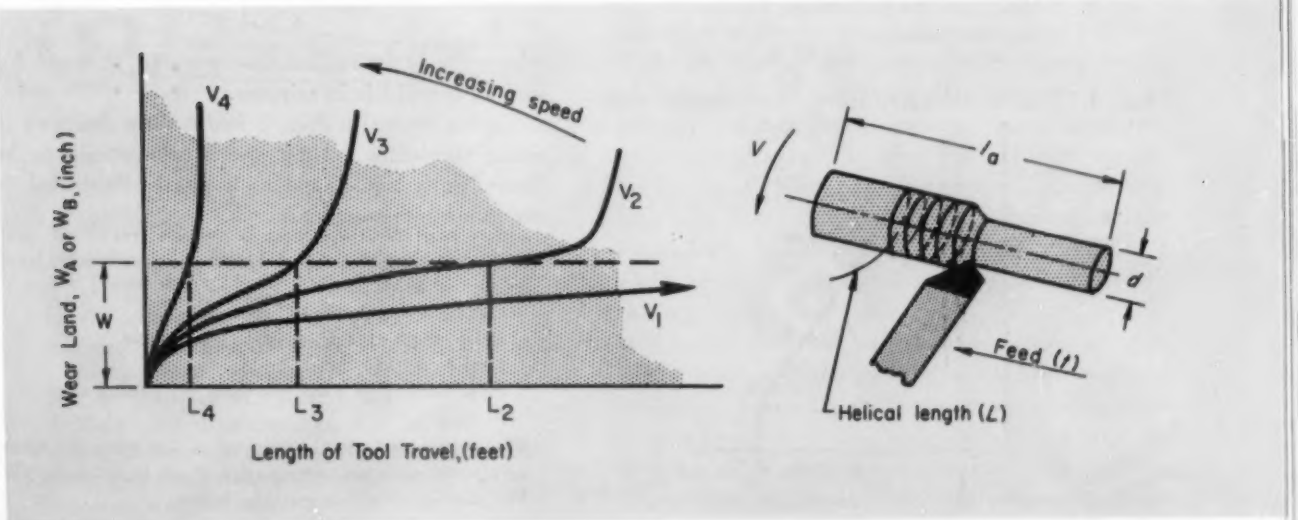
$d$ = work diameter, inches
$t$ = feed, ipr
$l_a$ = axial length of part, feet
$P$ = number of passes each of length $l_a$ that are taken during the life of the tool or, in production, the number of parts of axial length $l_a$ that are machined during the life of the tool

The wear curve is usually characterized by three regions:

1. Initially rapid wear or break-in.
2. Gradual wear, the curve usually being concave downward in this region
3. Accelerated wear leading to total destruction of the tool.

A tool should be taken from service before reaching the region of accelerated wear, since there is danger

**Fig. 3. Typical wear curves for carbide tool.**



of total destruction of the tool or of the workpiece if an attempt is made to operate in this region.

Assuming that wear land $w$ in *Fig.* 3 represents a satisfactory maximum allowable value, when the values of $L$ corresponding to wear land $w$, ($L_2$, $L_3$, $L_4$,) are plotted against the corresponding cutting speeds ($V_2$, $V_3$, $V_4$,) on log-log coordinates, a plot such as that of *Fig.* 4 is obtained. In the usual operating region of speed a straight-line relation corresponding to the following equation generally holds:

$$VL^s = K \quad \text{.....(2)}$$

In this equation $S$ and $K$ are constants, $S$ being the slope of the curve of *Fig.* 4. The quantity $S$ is a very useful quantity, since it enables the speed corresponding to minimum machining cost per part to be readily determined.

## Machining Costs

When a part is machined in a lathe, the question of just what speed to use naturally arises. If a high cutting speed is used, labor cost will be low, but tool life will also be low and hence tool cost high. The inverse is true for low cutting speed. There exists a cutting speed for each operation at which the cost per part machined will be a minimum. F. W. Taylor recognized this in 1906 and presented a method of finding such speeds by use of specially constructed slide rules.

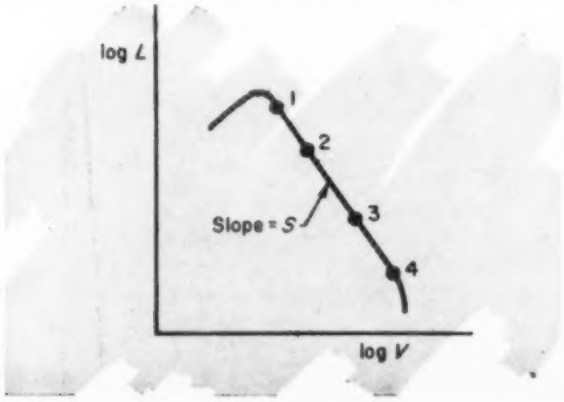
The costs per part, ¢, associated with a machining operation include: costs per part for labor, value of the machine and overhead; cost per part for idle machine time, and cost per part for tool regrinding. This can be expressed as:

$$¢ = xT_c + xT_d\left(\frac{T_c}{T}\right) + Y\left(\frac{T_c}{T}\right) \quad \text{.....(3)}$$

where

$x$ = value of machine, labor and overhead, cents per minute
$T_c$ = cutting time per part, minutes
$T_d$ = down time for tool change, minutes
$T$ = tool life, minutes

**Fig. 4. Typical life-speed curve for carbide tool.**




$Y$ = mean value of cutting edge, cents
$N$ = spindle speed in revolutions per minute

and

$$T_c = \frac{l_a}{tN}$$

It can be shown that the cost per part is a minimum when the cutting speed is so chosen that the tool life is:

$$T = \left(\frac{x\,T_d + Y}{x}\right)\left(\frac{1}{S}\right) = \frac{R}{S} \quad \text{.....(4)}$$

where

$$R = \frac{xT_d + Y}{x} \text{ or the cost ratio}$$

$S$ = slope of the wear curve, *Fig.* 4

If the speed of a machine is adjusted to a value $V_1$ and then to a value $V_2$, the corresponding numbers of satisfactory parts produced, $P_1$ and $P_2$, may be determined. In making such tests, the tools should be taken from service, not when the wear land reaches some predetermined value, but rather when the tool ceases to produce parts that pass inspection, whether it be due to lack of finish or dimensional accuracy. This procedure circumvents the necessity for deciding just what wear land, $w$, should be used. In making tests of this sort, values for at least three tests should be averaged at each speed. The slope of the life curve, $S$ may then be found as follows:

$$S = \frac{\log\left(\frac{V_2}{V_1}\right)}{\log\left(\frac{P_1}{P_2}\right)} = \frac{\log\left(\frac{N_2}{N_1}\right)}{\log\left(\frac{P_1}{P_2}\right)} \quad \text{.....(5)}$$

By use of equations 4 and 5, the optimum tool life may readily be found. The work speed corresponding to the optimum tool life is of importance for it is this speed that should be used in practice. It can be shown that:

$$\frac{N}{N_1} = \left(\frac{T_{c1}P_1}{T}\right)^{\frac{S}{1+S}} = \frac{N}{N_1} = \left(\frac{T_1}{T}\right)^{\frac{S}{1+S}} \quad \text{.....(6)}$$

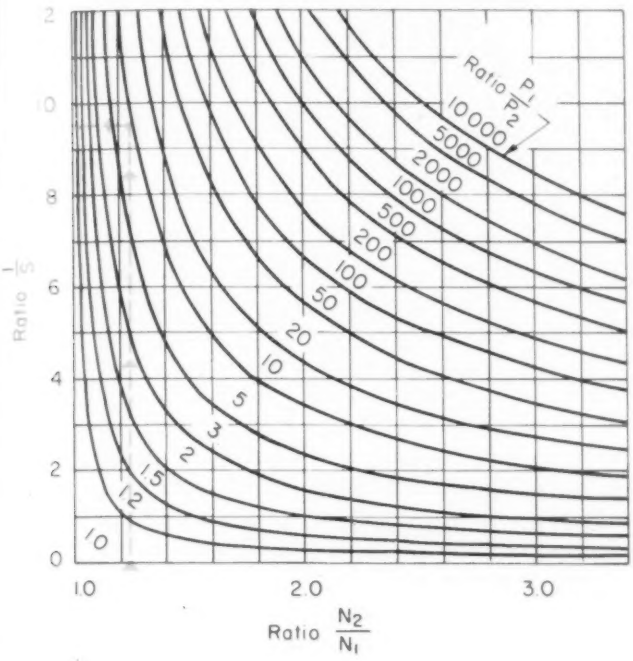
where $T_{C1}$ is the cutting time per part at speed $N_1$, and $T_1$ is tool life in minutes.

Curves shown in *Figs.* 5 and 6 were designed to enable optimum cutting speed calculations to be conveniently made, and their use is illustrated in the following example:

Consider a turning operation that is currently being performed as follows:
Cutting speed $N_1 = 400$ rpm
Axial length of cut per part $l_a = 2.00$ in.
Feed $t = 0.010$ ipr
Mean number of parts produced per cutting edge $P_1 = 800$

When the speed, $N_2$, is changed to 500 rpm, the mean number of parts per cutting edge, $P_2$, is found to be 100. The cost data for this machine follow:

**Fig. 5. Chart for determining optimum cutting speed corresponding to minimum cost per part in conjunction with chart in *Fig.* 6. Dotted line shows determination of constant $1/S$, defined in *Fig.* 4.**



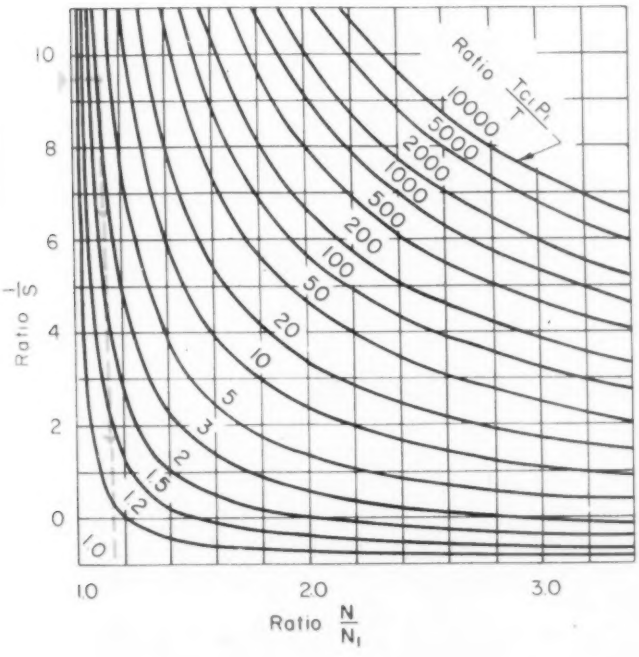




**Fig. 6. Chart for determining optimum cutting speed corresponding to minimum cost per part using value for $1/S$ found in *Fig.* 5.**

1. Value of machine, labor and overhead, $x$ = \$6.00 per hour or 10 cents per min.
2. Time to change tool, $T_d$ = 5 min.
3. Mean value of cutting edge, $Y$ = 90 cents

The tool used in this operation is a disposable carbide tip with four cutting edges and would cost $4Y$.

The cost ratio in this case is:

$$R = \frac{xT_d + Y}{x} = \frac{(10)(5) + 90}{10} = 14$$

while

$$\frac{N_2}{N_1} = 1.25$$

$$\frac{P_1}{P_2} = 8.00$$

By reference to *Fig.* 5, it is seen that for this example $1/S$ is 9.3, and hence from equation 5:

$$T = \frac{R}{S}$$

$$= (14)(9.3) = 130 \text{ min.}$$

and

$$T_{c1} = \frac{l_a}{tN_1} = \frac{2.00}{(0.010)(400)} = 0.500 \text{ min.}$$

hence,

$$\frac{T_{c1}P_1}{T} = \frac{(0.500)(800)}{130} = 3.08$$

Now, from *Fig.* 6, $N/N_1$ is found to be 1.13 and thus $N$ is $(1.13)(400)$ = 452 rpm. The available speed closest to this value should, of course, be used.

If the life-speed relation in this instance should not be a straight line on log-log coordinates as assumed in the above example, then $N$ = 452 rpm will not yield $T$ = 130 min. when a check is made on the machine. In such a case the values of $N$ and the observed equivalent value of $P$ should be used with $P_1,N_1$ or $P_2,V_2$, whichever is closest and a redetermination for $T$ made. This procedure will lead to a better check between $T$ and $N$, since a curved relation on log-log coordinates becomes better approximated by a straight line as the interval between points considered is decreased.

A substantial reduction in cost per part would be obtained in this instance by increasing the work speed from 400 rpm to 452 rpm, even though the tool life would decrease from 400 to 130 min. in so doing. There is a general tendency to give too much weight to tool life and instinctively a tool will be operated at too low a speed in order that the tool life be of 6 or 8 hours' duration. Taylor warned against this practice long ago and pointed out that in rough turning the cost-optimum speed for a ½-inch HSS tool was generally of the order of 90 minutes. At that time it was customary to operate such tools at speeds to give a tool life of several hours. Need exists today to reiterate Taylor's message. While the cost-optimum life of most carbide tools used in rough turning operations is between 1 and 3 hours, often such tools are operated at speeds designed to give much longer life.

It might be argued that carbide tools are generally more costly than HSS tools and hence the optimum values of tool life for present carbide tools should be significantly greater than values cited for HSS tools. Two important additional changes have taken place, however, that tend to neutralize this

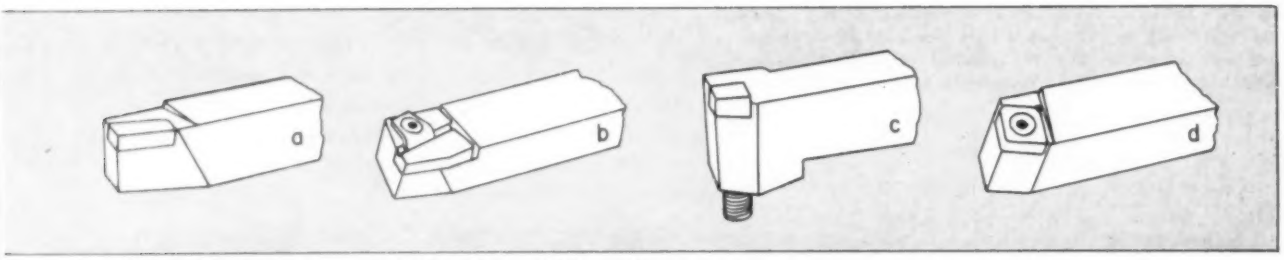



**Fig. 7. Different types of single-point carbide cutting tools: (a) brazed; (b) clamped; (c) regrindable insert; and (d) throw-away insert.**

difference: (1) the cost of labor and machines has greatly increased to cause $x$ to be much greater relative to the cost of tools, $Y$. (2) the design of carbide tools has been simplified in recent years to provide a substantial decrease in the cost per cutting edge, $Y$, and the time required to replace a cutting edge, $T_d$. All these changes tend to provide a value of the cost ratio, $R$, for carbide tools that is not much greater than that for a HSS tool.

Some of the changes in carbide tool design that have made possible a decrease in the cost per cutting edge are illustrated in *Fig. 7*. The tool shown at (*a*) is the conventional brazed tool which has several angles that must be ground with a diamond wheel. In the tool shown at (*b*) brazing is eliminated, so the cost of the tool is reduced somewhat but there are still several surfaces that must be ground each time the tool is reconditioned. Tool (*c*) has four cutting edges at each end or a total of eight and a quick means for changing the cutting edge. Another tool providing a decreased tool changing time, $T_d$, and low cost per cutting edge, $Y$, is shown at (*d*). The tool at (*d*) involves such a small volume of carbide that it can be discarded after the four edges have been used. The insert shown at (*c*), on the other hand, can be reground several times before being discarded. In the previous example a tool such as that shown at (*d*) was considered.

By means of the charts, *Figs.* 5 and 6, and a few simple trials in the shop, it is possible to quickly determine the speed at which an operation should be performed to provide parts of minimum cost. By use of procedures similar to that outlined in the example, it is possible to quickly determine how much additional cost is justified for a superior cutting fluid that permits a faster machining rate, the additional cost of work material that is justified due to improved machinability or the additional cost of tooling associated with improved tool life and many similar problems. In all these cases the basis of comparison should be the machining cost per part.

**References**

1. *On the Art of Cutting Metals*, by F. W. Taylor, Transactions, A.S.M.E., 28, 31, (1907).
2. *Economics of Machining*, by W. W. Gilbert, Chapter in ASM Book, Machining-Theory and Practice, published by ASM, Cleveland, Ohio, p. 465 (1950).

## Low-Temperature Brazing of Titanium

A PROCESS for titanium brazing at lower than normal brazing temperatures has been developed by the Stainless Processing Div. of Wall Colmonoy Corp. Because the usual higher brazing temperatures are not required, there is no distortion or embrittlement generally associated with brazing this metal.

Silver or silver-manganese brazing alloy is used without fluxes to fabricate an all-titanium alloy assembly of any size, or to join titanium to stainless steel or other alloys. With the process, which actually is a form of vacuum brazing, multiple brazing operations may be performed simultaneously.

Because of the wetting and flow characteristics, all joints of any contour or position are completely brazed. Consequently, complicated shapes or parts in which the titanium components have been assembled prior to application of the brazing alloy may be brazed easily. This point is particularly advantageous on such items as titanium alloy turbine blades and honeycomb sandwich sections where complete brazing of the upper joints is particularly difficult.

Typical example of use of the Wall Colmonoy technique is the brazing of a titanium part made of honeycomb sandwich sections. The sandwich is assembled with brazing alloy shim strips separating the titanium honeycomb from two titanium face sheets. The assembly is then placed in a retort and weighted to insure positive contact of all components with the brazing alloy during the brazing process. The retort cover then is lowered and clamped, and the retort placed in a vacuum furnace where the actual brazing process takes place. Following brazing, the section is trimmed to final size.

# helical carbide cutters

## *broaden scope of milling*

**By A. O. Schmidt***
**Research Engineer**
**Kearney & Trecker Corp.**
**Milwaukee, Wis.**

HELICAL CARBIDE CUTTERS have become standard tools in many shops because of improvements in materials and progress in tool design. Until recently the types of milling cutters which could be made successfully with carbide tips were face mills, slotting cutters and end mills. The primary reason for the limitation was that carbide cutting edges could readily be formed and ground only with straight angles and from flat or round stock. Tool engineers reasoned correctly that a helical carbide cutter with a smoother entrance would eliminate some problems of vibration and chip formation as well as limitations of setup in milling. However, many of the early attempts to make such cutters, principally helical slab mills, ended in failure when an attempt was made to form or grind a helix into a piece of carbide. The lone exception was small diameter helical end mills made of solid carbide.

Quality of the latest carbide materials has been improved and the technique of forming carbides has advanced so that it is now possible to make carbide slab mills and end mills with a true spiral or helix. They look like and work as smoothly as similar HSS cutters but at higher speeds and feeds, *Fig.* 1. These cutters are also available with cast alloy teeth, *Fig.* 2, and are a definite step forward in the milling of cast iron and steel, since

*Senior member ASTE Milwaukee chapter.

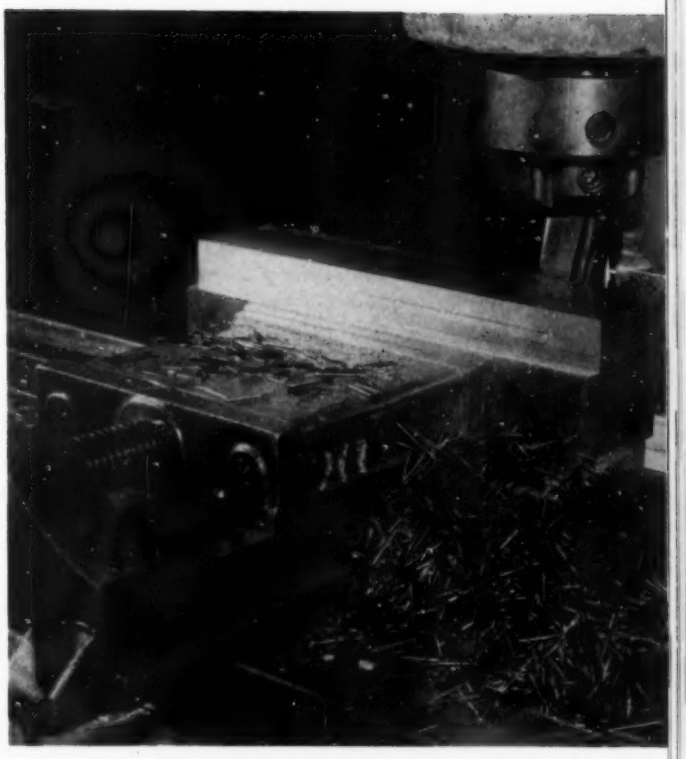


**Fig. 1. (top right) End mill with helical carbide teeth milling a forming die.**

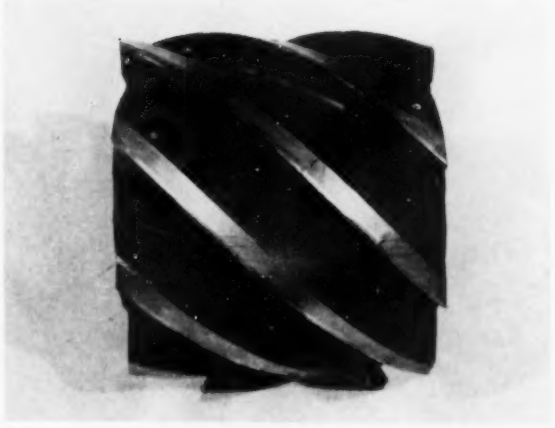


**Fig. 2. (bottom right) Slab mill, 4-inch diameter, with 8 brazed helical teeth made of cast alloy.**

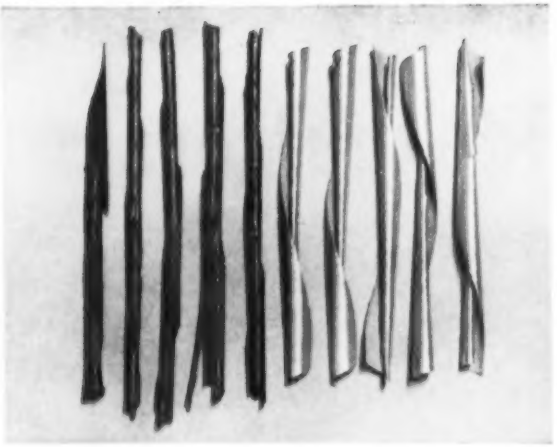


**Fig. 3. Cast-iron (dark color) and aluminum (light color) chips produced by helical carbide slab mill at 300 and 3000 fpm cutting speeds, respectively.**

they eliminate the impact action inherent in most carbide cutters and exert a more uniform torque on the spindle and arbor.

In *Fig.* 3 are shown cast-iron and aluminum chips produced by this type of cutter. The superior cutting action of a helical slab mill can be seen in the shape of the cast iron chips which are similar to those of aluminum. Carbide cutters with helical teeth have already reached a level of perfection and performance which permits them to be used on difficult milling operations. For instance, *Fig.* 1 shows a setup in which a forming die of SAE-4150 steel is milled at 180 fpm cutting speed and 13⅛ ipm feed.

In contrast a "porcupine" cutter, which was made more than 10 years ago, is shown in *Fig.* 4. This cutter was made with a negative radial rake angle and therefore did not work as well as a HSS cutter with the same helix angle when milling steel. It also was difficult to grind and to maintain. The round carbide tips were brazed into the steel body and replacement of these tips in case of breakage was an expensive operation. In addition the carbides available at that time exhibited a much greater tendency to break in milling steel than those obtainable today.

A successful slab mill design with carbide cutting edges is shown in *Fig.* 5. Straight carbide tips are brazed into a steel body at a small axial rake angle and with a positive radial rake angle. The latter varies continuously along the cutting edge because of the geometry of this construction. The cutter is used mainly for milling aluminum and magnesium but also is used on cast-iron and steel workpieces. When milling ferrous materials the cutter is mounted in such a way in relation to the helix that the side with less radial rake angle will enter the workpiece surface first.

Helical carbide tips are produced at the present time by pressing and sintering the correct shape as well as by hot forming from straight carbide blanks. These helical types of cutters are usually ground with a straight face on the carbide tip when intended for milling steel and cast iron and a concave face for use on nonferrous metals or plastic.

Better carbide grades and newer holding devices have recently permitted the successful design of a cutter similar to *Fig.* 4. The individual teeth are held mechanically and can easily be replaced in case of breakage. On the other hand, the radial rake angle no longer need be negative, since the newer carbides are stronger and will perform satisfactorily in steel milling even with a positive radial rake angle. Thus a helical carbide cutter can be designed to function with decreased tool forces or power requirement, to give good tool life, and to lead to smoother machine operation. The story of helical carbide cutters is a good example of the inter-action between the development of improved tool materials and advances in toolmaking and tool design.

**Fig. 4. Slab milling with a "porcupine cutter" having brazed carbide tips. This was one of the first developments of helical carbide cutters.**

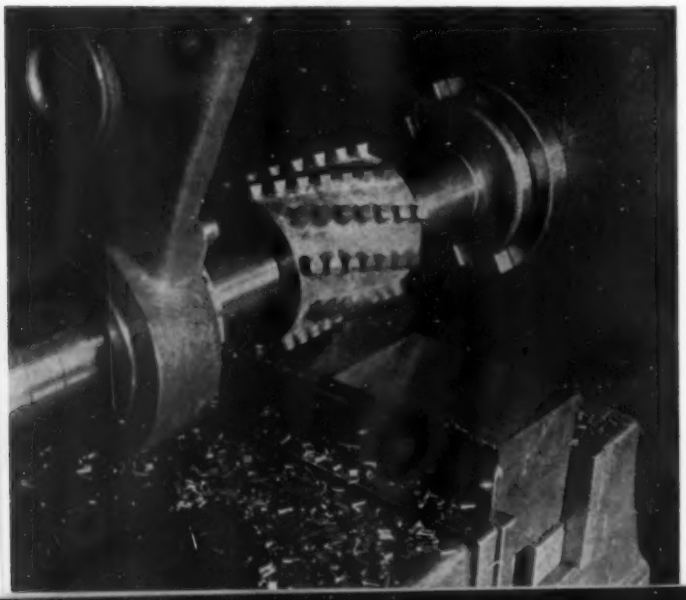
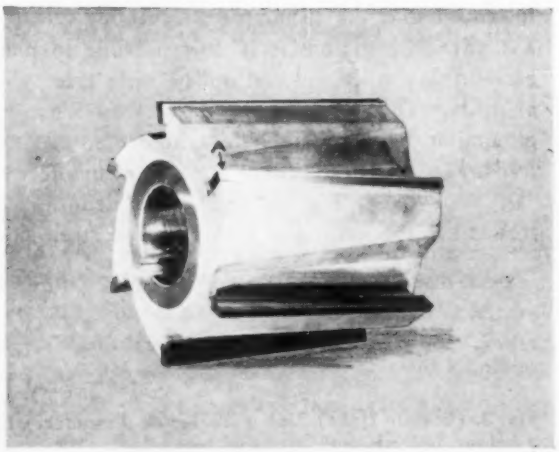


**Fig. 5. Slab mill, 4-inch diameter with 6 brazed straight carbide teeth, the radial rake angle is 0 deg at *A* and 8 deg at *B*.**



# arc welding

# for small-lot production

## part 3 - tooling the job

By Arthur H. Allen
Cleveland, Ohio

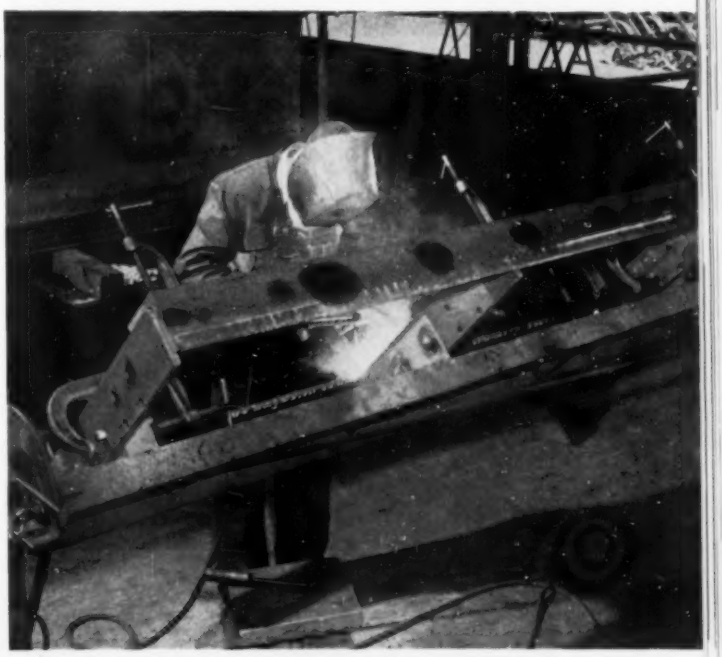
WHETHER a weldment is to be made by manual or automatic techniques, tooling is usually necessary in the form of fixtures, clamps, dies, gages and the like. Often, these are inexpensive particularly for small-lot production. The tooling itself is almost invariably of welded construction which helps minimize costs and makes for versatility and flexibility, *Figs.* 1 and 2. Tooling required for welding can be costly to purchase or build. Generally the more complex the basic weldment, the more expensive the tooling becomes, *Figs.* 3 and 4. Since it is general practice to amortize tooling over a full production run, careful attention must be given to tooling economies, especially for short production runs.

Consideration must be given to the part and component breakdown made on design drawings. It is in this area that the burden of economic design rests on the designer and his knowledge of modern welded construction. Often, the selection of a combination of two subcomponents such as a steel casting and a weldment or a weldment and a bent section will accomplish what might otherwise be nearly impossible in a single step.

### Use of Fixtures

The primary function of fixtures is to bring parts into accurate alignment for welding. Further, they are usually designed to present the assembled components in the best position for welding which, as previously noted, is downhand, requiring joints to be in the flat or near-flat position. To position the joint to be welded, the fixture may rotate, usually on trunnions, about an axis either by hand operation or through motor and reduction gear. Many

**Fig. 1. A simple trunnion mounted fixture for welding bases for farm machinery. The fixture can be changed quickly to accommodate different sizes. Trunnion permits working in downhand position.**



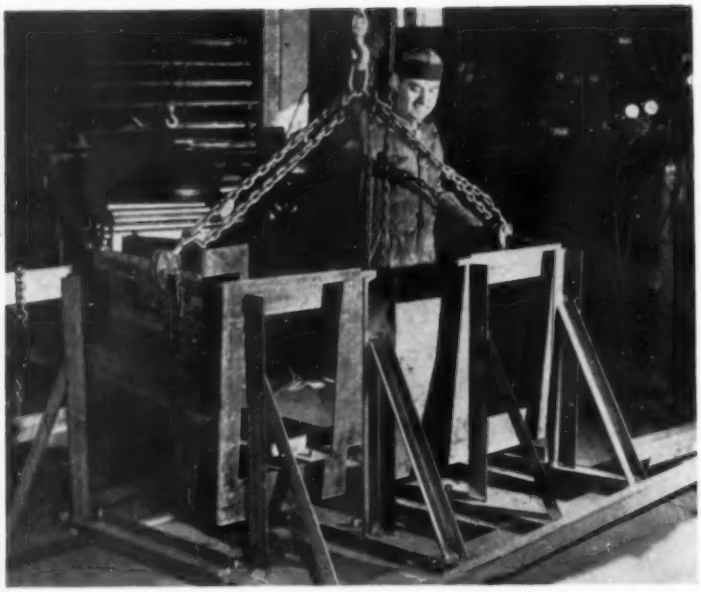


**Fig. 2. Simple floor jig made of channel and angle for assembling the parts of a machine tool base. The jig was made by the manufacturer in approximately 12 hours. Welding on the machine base is minimized by bending a plate to make three sides, eliminating two corner welds. After tacking, base is removed from jig for final welding.**

standard types of welding positioners and tables can be purchased or built. They are readily adaptable to a wide variety of work, *Fig.* 5, thus being productive of lower costs than with more intricate and special single-purpose devices.

Provision of duplicate fixtures serves to increase the "operating factor" on many jobs, *Fig.* 6. For example, assuming that it takes a welding operator two minutes to assemble parts in a fixture and two minutes to complete the welds, production would amount to fifteen parts per hour. With the addition of a second fixture and employment of a helper who assembles components in one fixture, while the operator is welding in the other, production is increased to thirty weldments an hour at the cost of one additional fixture and the services of one helper.

Fabrication of fixtures by arc welding is generally advisable. In most instances, standard steel shapes can be used and the cost of patterns for castings avoided. Furthermore, welded construction permits easy modification. It is usually found that a fixture will not function the first time exactly as anticipated. Economical alterations may be made by torch cutting and rewelding. Light weight, high strength, portability and easy storage are other advantages. Where wear is involved, surfaces may be hardfaced with the use of special high-alloy welding electrodes. As with any form of tooling, precision is essential in the construction of welding fixtures for any quantity of production.

It is occasionally feasible to modify old or discarded machine equipment to serve as welding fixtures, thereby saving considerably over building up an entirely new unit. A radial drill, *Fig.* 7, or perhaps an outmoded lathe might be adapted conveniently, with the addition of some air or toggle clamps, to position the elements of a weldment. Another example is the machine illustrated in *Fig.* 8, designed for flexibility in application.

Cost of special fixtures should be amortized fully over the production run on a part, or at most after a year's service. This places restrictions on the investment in tooling but, at the same time, keeps engineers alert and insures steady progress in manufacturing economy.

For assembly of weldments both large and small, it is sometimes practical to provide two fixtures, the first to assemble and position the various components for manual tack welding. The tack-welded assembly then is transferred to a second fixture or simply to the floor for completing the welds by either manual or automatic methods, *Fig.* 9. In this way, distortion is held to a minimum and accurate alignment is better assured.

**Fig. 3. Large rigid fixture of tubular construction holds parts firmly in position and controls distortion in welding.**

For large weldments, especially when only two or three are being made, fixtures can be eliminated. Parts can be aligned for welding using a scale and a square and clamped for welding with C-clamps, wedges or other holding devices such as the new magnetic clamps.

Numerous other expedients have been devised to minimize distortion and warpage. The problem is critical in welding thin-gage material and can be overcome by using clamps of copper to which water cooling tubes have been soldered. Another device to compensate for warpage involves the shaping of fixtures with suitable curvature or camber so that, when the weldment is completed, it will compensate for distortion, achieving the desired final contour of the part.

## Effects of Procedures on Costs

A typical procedure in the production of a new part of welded design is to turn the problem over initially to a production engineer or someone working in that capacity. He will likely decide to process a trial lot or "pilot run," possibly with temporary tooling, to discover any hidden kinks in procedure before making any major investment in tooling.

In this phase, some of the welding equipment manufacturers have offered their assistance by setting up to produce trial samples in their own plants and to recommend the best welding techniques and equipment for the job. This usually follows preliminary consultation with the equipment manufacturer's field engineers.

Strength and cost are the governing factors in mapping out any welding procedure. The welding process as such is not overly expensive as to material and tooling. The initial cost of equipment is one of the lowest for any fabrication method. Consumption of power and electrodes in welding is not excessive in comparison with such costs as power and tool wear, breakage and maintenance for production machining.

In the final analysis, welding costs come back to the factor of arc speed potentials already discussed in detail. These, in turn, are related to the process selected and to electrode size. Assuming the most efficient setup of equipment, the effect on cost of varying electrode sizes to realize higher melt-off and deposition rates is illustrated in TABLE 1, showing cost reduction and production increase.

Another cost comparison of different size elec-

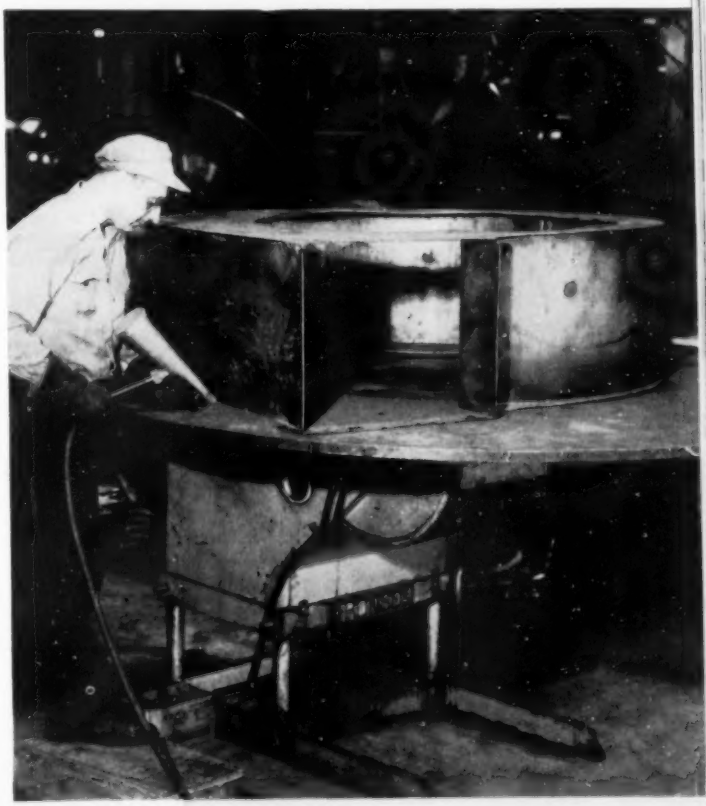


**Fig. 5. Standard power driven positioners are commercially available and can be adapted for many types of jobs. This standard positioner has a large table added to accommodate a large weldment. It is used in conjunction with semi-automatic equipment for hidden arc welding.**

**Fig. 4. Trunnion fixture for positioning railroad car underframes. Fixture is on wheels to permit moving work from one station to the next.**

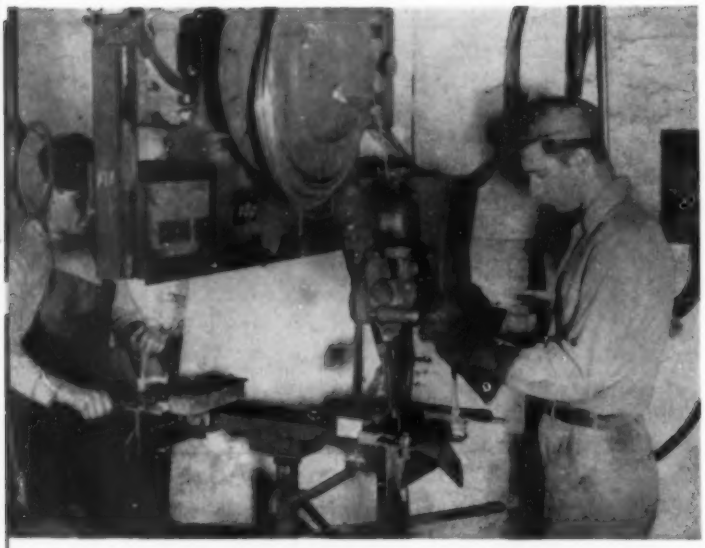


**Fig. 6. Duplicate fixtures, provided for this automatic setup for welding plowshares, increase operating factor. Tooling is extremely simple.**

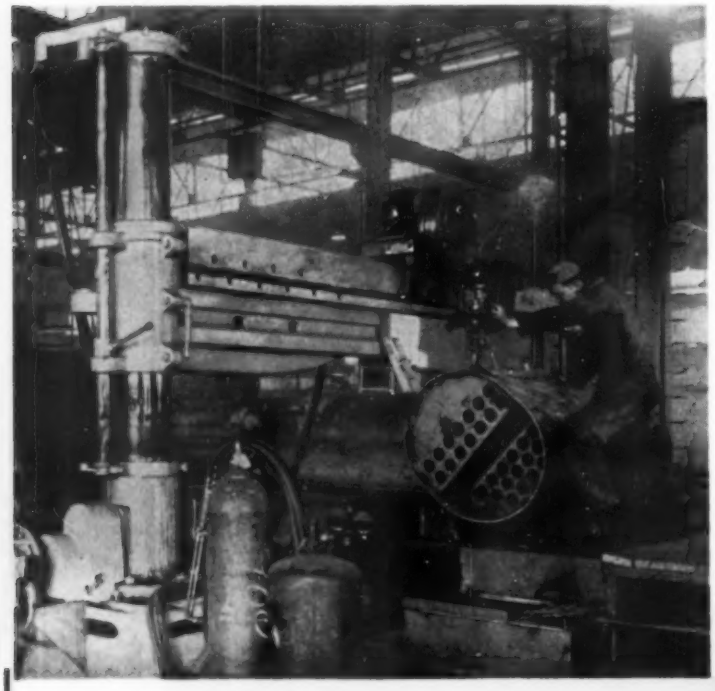


**Fig. 7. Radial drill adapted for mounting a fully automatic welding head. The head covers a wide area in which a number of jobs can be set up.**

trodes, including wire used in the hidden-arc process, all based on deposition of 1 pound of electrode metal, is given in TABLE 2. This shows how the use of higher currents and larger diameter electrodes successively lowers the cost of deposited metal.

Exercise of care in cutting, forming and handling of shapes to assure a good fit-up for welding is a major factor bearing on costs. A gap of $\frac{1}{64}$ to $\frac{1}{32}$ inch is preferable in most joints, helping to prevent angular distortion and weld cracking. However, such gaps should be uniform along the joint, particularly where automatic welding is the practice. Naturally, the width of the gap affects welding speed significantly. A fillet weld equivalent in strength to a $\frac{7}{16}$-inch conventional fillet can be run manually at 12 inches per minute with a $\frac{1}{32}$-inch gap, but this speed decreases to 8 inches per minute when the gap is $\frac{1}{8}$ inch, while a gap of $\frac{3}{16}$ inch requires a multiple-pass weld, and the speed drops to 3 inches per minute.

In many weldments with long, straight seams a continuous weld not only wastes metal and welding time but also increases the likelihood of distortion. Skip welding is the answer by which is meant laying approximately 3 inches of bead, then skipping 3 inches and depositing another 3 inches, repeating this procedure for the full length of the joint. Ample strength usually can be assured in the joint and distortion is either eliminated or held to a minimum.

Skip welding, of course, reduces the amount of deposited metal per foot of welded joint and, therefore, contributes to lower over-all costs. Another way to obtain less metal deposition is through greater penetration into the joint by the arc, accomplished by higher current. This means that the joint will comprise more fused base or parent metal. As an example, by penetrating into the

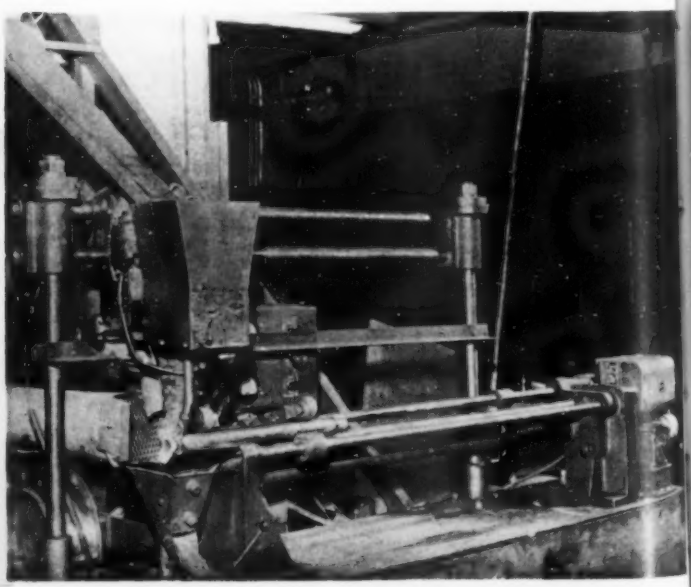


**Fig. 8. Flexible welding fixture in the service department of an automobile manufacturer. It is readily adjustable to accommodate different size parts that have to be made for parts orders.**

**Fig. 9. Wheel after being assembled in correct alignment and tack welded in the fixture shown on the table, is positioned on a simple fixture for finish welding.**

corner of a fillet weld, it is possible to reduce the cross sectional area of the deposited metal by perhaps 50 percent with a comparable reduction in man-hours required to make the weld. Deeper penetration also permits changing from a V-butt joint to a plain square edge joint with an attendant reduction of 50 percent in deposited metal and 78 percent reduction in man-hours, together with the elimination of the need for edge beveling.

When the most favorable welding procedures and sequences of operations have been determined, they should be drawn up in written form for the information of both operators and inspectors. These procedures should be adhered to rigidly. Obviously, as production gets into full swing, minor modifications in procedures may become advisable. These can be incorporated easily into the established written procedure standards. The important thing is that there be instructions to govern all operations, not leaving too much discretionary leeway to the operator.

## Summary

The foregoing discussion has been broad rather than specific in scope. However, with the knowledge of exactly what the product is, how much welding it may require and within what cost limitations it must be made, the individual engineer can relate these basic considerations or ground rules to his own production problem.

Arc welding is definitely an economical and useful production tool for both large and small quantity runs and for a broad range of weldment sizes. It has become more so with the advent of automatic and semiautomatic techniques. Also, improved electrodes give higher welding speeds, deeper penetration and better weld appearance. At the same time, these developments reduce the labor content in each foot of weld, a factor which has been demonstrated to be 86 percent of the total cost of a weldment.

In common with other manufacturing processes, the goal is to produce weldments meeting all service and performance demands at the lowest possible unit cost. Achieving this end calls for an understanding of the fundamentals of welded design and welding procedures plus a good measure of common sense and ingenuity. With these ingredients at hand, they can be profitably seasoned by the experience and advice of application engineers associated with the various welding equipment manufacturers. Such service is always ready for the asking.

**Acknowledgments:** The author acknowledges the helpful assistance of the Application Engineering Department of the Lincoln Electric Co. in supplying photographs and data for this article.

**Table 1—Influence of Arc Speed on Welding Costs**

| Arc Speed (ft/hr) | Arc Time (hr) | Setup Time (hr) | Total Time (hr) | Total Cost* ($) | Cost Reduction ($) | Production Increase† (%) |
|---|---|---|---|---|---|---|
| 20 | 5.0 | 2 | 7.0 | 14.00 | 0 | 0 |
| 25 | 4.0 | 2 | 6.0 | 12.00 | 2.00 | 17 |
| 30 | 3.3 | 2 | 5.3 | 10.60 | 3.40 | 32 |
| 40 | 2.5 | 2 | 4.5 | 9.00 | 5.00 | 55 |

*Cost is estimated at $2.00 per hour.

†Based on 7 hours and in each case for a unit of about 100 feet of weld.

**Table 2—Effect of Electrode Size on Cost***

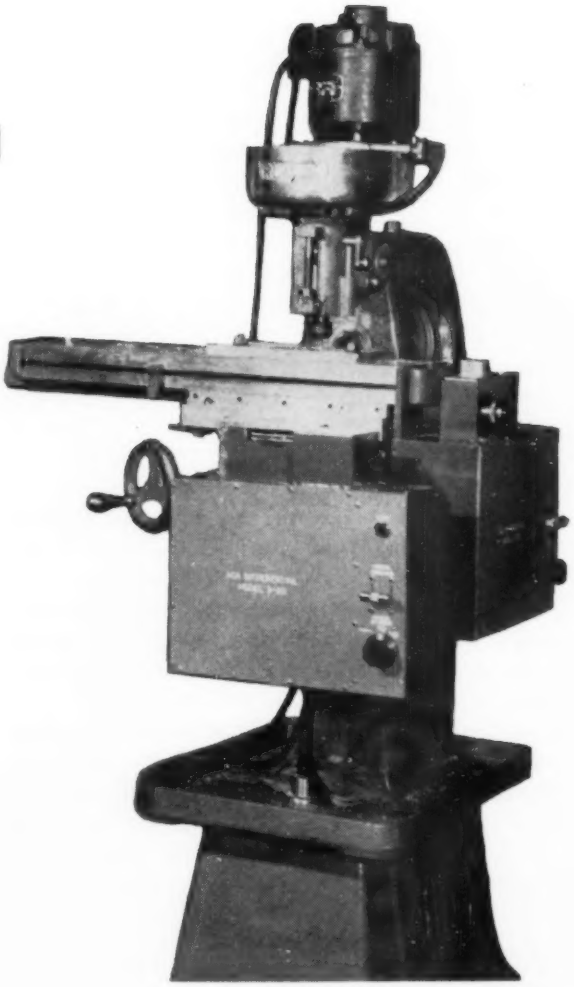
| Electrode Size (inch) | Welding Current (amp) | Cost per lb deposited metal ($) |
|---|---|---|
| 1/8 | 110 | 4.50 |
| 5/32 | 140 | 3.60 |
| 3/16 | 200 | 3.00 |
| 1/4 | 325 | 1.60 |
| 5/16 | 400 | 1.20 |
| Hidden arc | 800 | 0.50 |

*Based on 30 percent spatter, stub end and coating loss; 200 percent overhead; power at 2c per kwh; labor at $1.25 per hr.; operating factor 50 percent.

*designed for*

# PRODUCTION

## Magnetic Tape Directs Three-Dimensional Mill



Magnetically recorded information can be used to direct the operation of machine tools without the need for production of sample parts or precision cams. Blueprint specifications are translated into accurately spaced digital pulses on magnetic film in the ACA process developed by Magnasync Mfg. Co., Ltd., North Hollywood, Calif.

Digital pulses are reproduced and amplified to operate synchronous motor differential assemblies, as on the pictured mill. Controlled movement is achieved by varying the frequency of one motor in each assembly with respect to a stable reference frequency driving the other. A differential assembly is required for each dimensional movement. Reproducibility is high, with accuracies of 0.0001 inch reported.

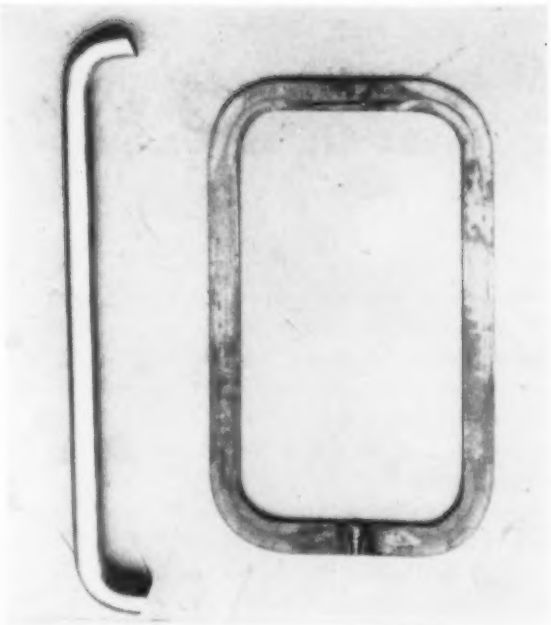
Magnetically recorded "tooling" could have strategic value if industry should decentralize. Recorded information could be transmitted through wires or beamed by radio to any location. Armed Forces units could conceivably operate without spare parts. A mobile machine shop in radio contact with a record storage vault could reproduce any part that might be required.

## PRODUCTION BENDING reduces fabrication costs

By applying hydraulic bending equipment to the manufacture of electrical transformers, the Line Material Co., Zanesville, Ohio, has improved results and reduced costs. An important factor in reducing expenditures and in reducing the over-all size of the transformer has been the standardizing of bending radii. This effectively reduced the amount of tooling required. One set of tools, for example, can make all the bends needed for form-

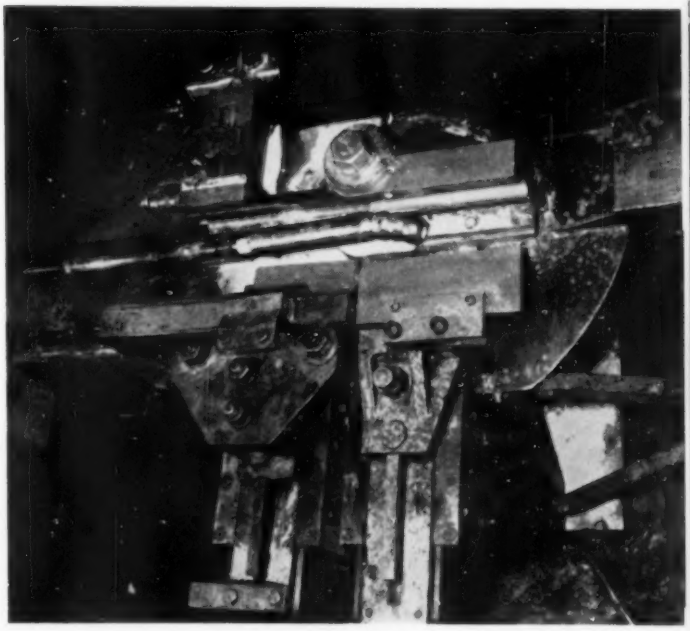
ing bends in tubing sections of 50 different lengths.

By applying two jobs to the same Pines Size 2 bending machine, greater efficiency is achieved. This application has reduced the amount of idle time on a machine that might otherwise not maximize the profit possible with the equipment investment.



TRANSFORMER cooling tube and flange bar formed on the same hydraulic bender. Cooling tubes are formed cold in different lengths of 2-inch OD by 0.083-inch welded steel with a single set of tooling. Since 90-deg bends can be made with a centerline radius of only 2⅜ inches, considerable reduction in transformer dimensions is possible. By using a production bending machine for forming four 90-deg bends in the flange bars, seven welding operations are avoided. Bars are made of hot rolled steel 2 inches wide by ⅜ inch thick. Inside bending radius is 2⅜ inch. After the four bends are made, the loose ends are welded together. A total of 36 flange sizes are handled by the machine with one setup and one set of tooling.

THREE-BALL flexible mandrel and wiper die produce smooth wrinkle-free bends by the draw bending process. A long, stationary clamping die completes the tooling for the bending machine. Water soluble lubricant applied to the inside and outside ends of the tubing assures good bending.

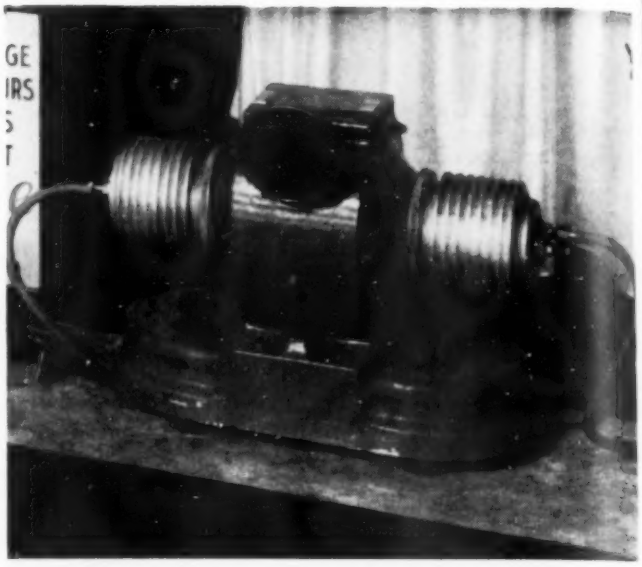


OVERHEAD VIEW of tooling shows how wiper die, upper left, on Pines Engineering Co. bender is fitted to the bending form. Proper fit and adjustment of the wiper die is important in making smooth bends to small radii.

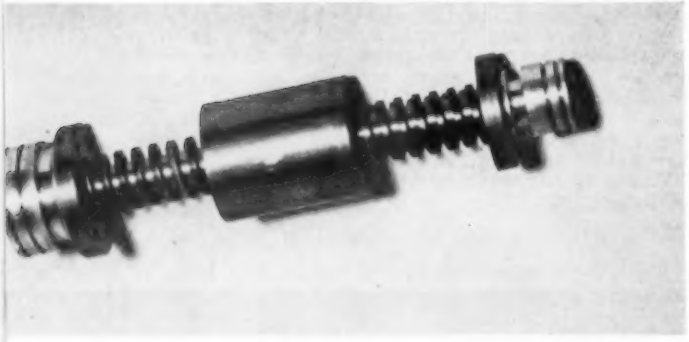
## Motorless Compressor Gives Quiet Air Supply

Capable of supplying air at pressures between 2 and 100 atmospheres, depending on size, the Nowak compressors are quiet in operation. The unit operates only when air is needed and requires no auxiliary starter or tanks. It can be used as a vacuum pump, in which use it will draw a 92 percent vacuum.

These compressors are built by Technical Supply Co., Antwerp, Belgium, and handled by J. C. Snoeys, Huntington Park, Calif. Because no motor or rotating parts are needed, power losses are minimized.



CORE EXCITATION causes the armature of this motorless compressor to pulsate as soon as the unit is plugged into an electrical power source. Selected air pressure is achieved in 1/50 second and the equipment stops within 1/50 second after the power supply is cut. Because of rapid attainment of full pressure, no air storage tank is needed. Air can be drawn from either end of the compressor, or the ends can be tied together with piping to form a single outlet.



ONLY MOVING PART in this compressor is the armature, which is axially connected with the double piston. Three thousand pulsations per minute, achieved electrodynamically and aided by springs, provide smooth air flow so no surge tank is needed. Stroke of the armature is automatically regulated by the use of air. With small demand, stroke is 0.78 inch; for maximum flow, stroke is 1.57 inch. Wear is minimized by these short strokes and adequate lubrication.

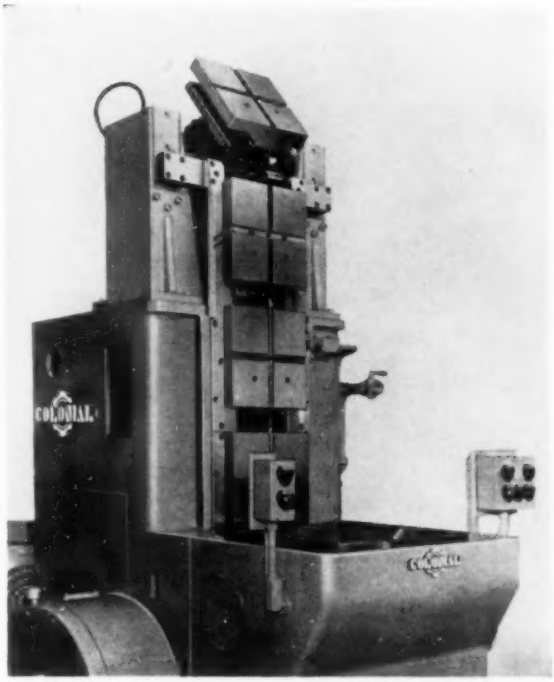
## Endless Chain Broach Carriers Increase Effective Stroke

Endless chain surface broaching machine design achieves almost continuous metal removal and, because no return stroke is used, over-all cycle time is reduced. Standing only 11½ feet high, with no pit, the Model VCA-10-150, built by Colonial Broach & Machine Co., Detroit, Mich., has an effective stroke of 12 feet 10 inches.

Additional features include wide carrier faces for mounting broaches and a wide work platen that can handle indexing or stationary fixtures. Multiple tooling can be installed for simultaneously broaching the same or different parts side by side. If parts being broached require less than half the available stroke, duplicate tooling can be installed and controls modified to provide two or more cycles for each revolution of the chain. Similarly,

with suitable broach spacing and control stops, two parts requiring a short stroke and one part requiring a long stroke can be broached side by side during a single revolution of the chain.

Tower of the machine is constructed so that it can be raised with extension inserts and a longer broach carrier chain installed. Additional carriers may then be attached to the chain, increasing the effective stroke to as much as 18 feet. Base and frame of the standard machine are heavily reinforced to take this added load.



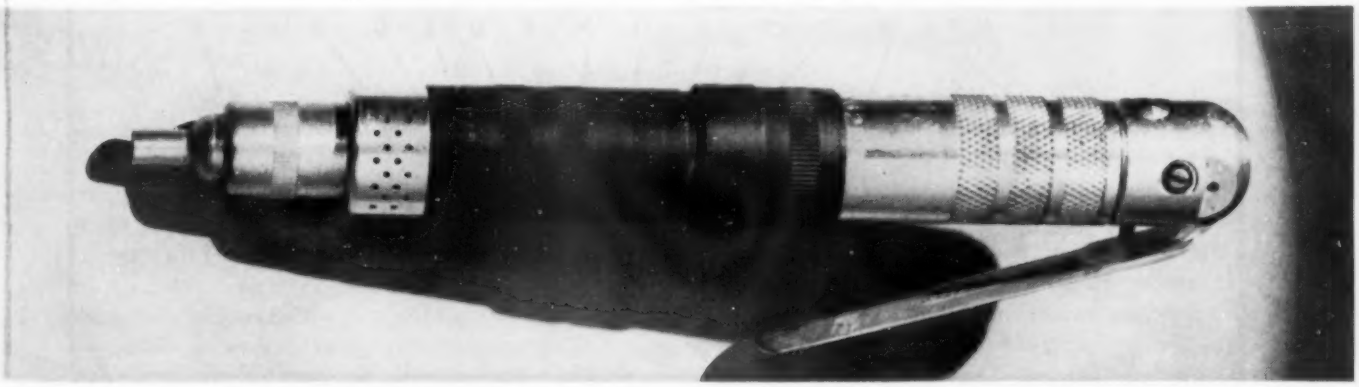

BROACH CARRIERS move downward on the front of the machine, entering precision ways before contacting the work. The part being broached is held stationary by suitable fixtures on the work platen. After entering the ways, broach carriers become individual rams. The chain applies only down-pull on the ram; gibs and ways support the ram while broach teeth are cutting desired shape on workpiece.

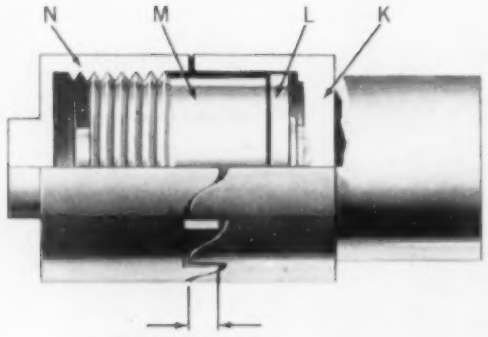
## Threaded Fasteners Torqued Accurately

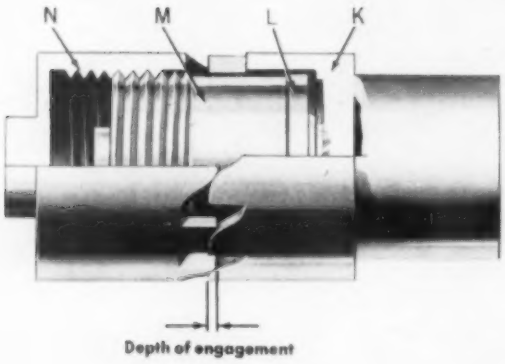
To get maximum efficiency from a threaded fastener, it usually should be driven to from 80 to 85 percent of its breaking or stripping load. A screw that is driven too tightly may strip its threads, break or distort the part, or cause ultimate failure of the assembly. Failure can also occur if the fastener is too loose. The torque controlled Magnamatic screwdriver produced by Chicago Pneumatic Tool Co., New York, N.Y. permits desired torque to be applied consistently over large production runs without reliance on operator skill, with increased tool life and at a higher production rate.

The big problem in power drivers is stopping the turning action when proper tightness is achieved. An air motor can be used with its stall point regulated to give correct torque. Stalling does not hurt the air motor and stalling can be adjusted by regu-

TORQUE-CONTROLLED portable power screwdriver and nutrunner gives correct tightness to fastener without dependence on operator skill. Reduced work spoilage, higher production rates and lower clutch maintenance costs result from nonratcheting action. Silent operation is assured by lack of ratcheting and an accoustic baffle.






TORQUE SETTING is achieved by screwing the magnet assembly into or out of the upper clutch jaw. This adjustment changes the depth of engagement and the angle of contact of the teeth on the clutch jaws. Top drawing shows clutch set for maximum torque. Magnet assembly *M* is screwed into upper jaw *N* as far as it will go, allowing lower jaw *K* to move to the left until the armature plate *L* contacts the magnet assembly. Torque required to cam the lower jaw out of and away from the upper jaw is high because of the steep angle of contact of the teeth. The lower sketch shows the clutch set to deliver minimum torque.

lating air pressure. This gives reasonable accuracies at speeds below 500 rpm. At speeds above 500 rpm, magnitude of the flywheel effect of the motor parts introduces variables that result in inconsistent tightening.

A mechanical clutch, which disengages when the desired tightness has been reached, can be used at the higher speeds but final tightness depends on operator skill. Such clutches include a mechanical linkage that disengages momentarily when full tightness is approached. They immediately re-engage and continue to "ratchet" until power is shut off. Ratcheting results in poor tightness, broken fasteners, damaged screw slots, excessive tool wear and disturbing noise.

The Magnamatic clutch disengages fully the instant proper torque is attained and stays disengaged until the unit is removed from the work. Thus, the disadvantages of ratcheting are surmounted by this "one-shot" clutch.

AT DESIRED TORQUE, lower jaw *K* cams out of upper jaw *N* against the pull of magnet *M*. When distance between armature plate *L* and magnet is about 0.015 inch, magnet pull is overcome and camming action throws jaw *K* further forward. When this jaw moves forward, its inside taper lets lock pin *G* be moved outward by tapered sleeve *F*, which is pushed rearward by spring *E*. Pin *G* wedges on taper of jaw *K*, keeping it from re-engagement with jaw *N*. Because jaws lock out of engagement, torque build-up is prevented no matter how long tool is held on work. When tool is removed from the work, clutch re-engages and is ready for application to the next fastener. All parts shown are free to rotate. Those shown in grey are free to more axially while those shown in black are fixed axially.

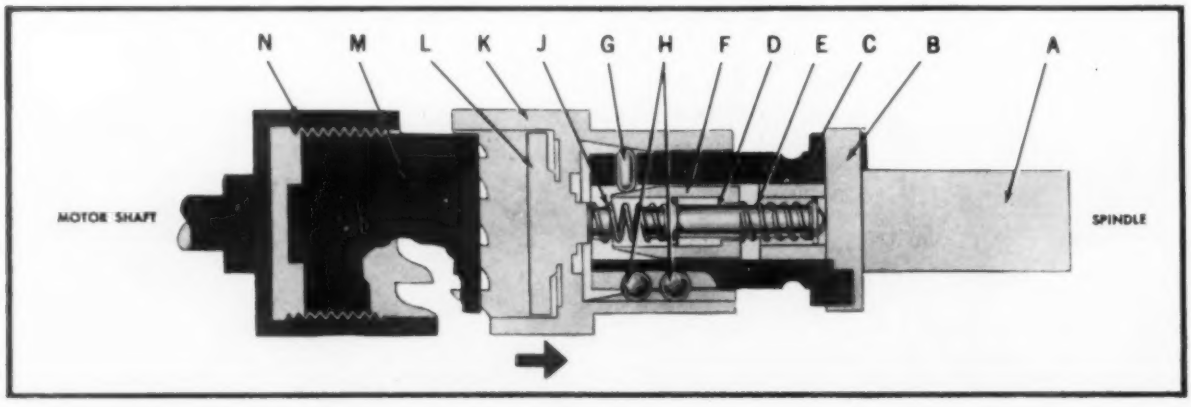


Fig. 1. Typical inspection department installation with a black granite surface plate. Measurements of a production part are checked to print.

# surface plates

## compared by physical tests

**By Richard Merriam**
**Associate Professor**
**Department of Geology**
**University of Southern California**
**Los Angeles, Calif.**

INCREASING UTILIZATION of rock surface plates has caused numerous questions to be raised. Since users of surface plates are generally unfamiliar with the physical properties of rocks, they may be unable to evaluate plates and other inspection equipment made of these materials, *Figs.* 1 and 2. For these reasons data accumulated in the course of a systematic investigation of rock surface plates are presented.

Most, if not all, rock surface plates are made of rock which falls in the general classification of granite. According to the detailed classification of the geologist, eight or ten distinct rocks lie in this group. Terminology followed in this article is that of the American Society for Testing Materials, which recognizes two groups: (1) "granite," which is usually a pink to light-grey rock composed principally of quartz, feldspar and mica grains ranging from approximately 0.05 to 0.3 inch; and (2) "black granite," a dark grey to black rock of the same grain size but consisting of feldspar and one or more common dark rock-forming minerals.

Regardless of the specific type, all such rocks are believed by geologists to have been formed by the slow cooling and crystallization of a molten material at great depths and pressures.

**Strength Characteristics:** Of the numerous tests which have been applied to rocks, one of the commonest is compressive strength. Values given for this property are variable and somewhat inconsistent. This may be due to differences in technique of testing, size and shape of specimen and orientation of specimen (i.e., across grain or parallel to grain). Roughly, the quoted values range from 6,000 to 60,000 psi. Probably the principal factor in strength is the texture of the rock. Texture is defined

as the relative sizes and shapes of the mineral grains and their relation to each other. Irregular, indented and interlocking grain boundaries result in a tough rock with a high compressive strength. This type of texture is more characteristic of black granite than granite.

Another strength characteristic is Young's modulus of elasticity ($E$). A large value for $E$ indicates a favorable rock. TABLE 1 gives the ranges for $E$ in three types of materials, showing black granite as superior to granite and comparing favorably with cast iron.

A similar property often tested is the modulus of rigidity ($G$). Since resistance to distortion is a necessary feature in surface plates, rocks having high values for $G$ are more favorable. TABLE 1 shows that black granite and cast iron are, roughly, equal, while both are superior to granite in these properties.

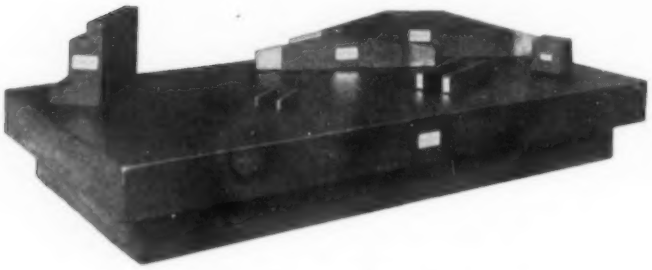


**Fig. 2. Inspection equipment made of granite includes angle plates, straight edges and parallels. Each is a highly accurate inspection tool.**

**Compressibility and Absorption:** These factors are largely functions of constituent minerals and their packing. Efficiently packed, close-fitting, interlocking grains result in low compressibility and low absorption.

High compressibility is objectionable in surface plates since it may allow mechanical deformations. Rocks with high absorption should also be avoided for they may absorb undue amounts of oil or other fluids, are difficult to clean and eventually develop a gummy surface.

Published tests on 116 rock samples show an average absorption of 0.28 percent of sample weight in one year. The average for all black granites of this group is but 0.09 percent per year. Compressibility, which goes hand-in-hand with porosity and absorption, is also lower for black granite, being 14.8 (reciprocal bars) compared with 20.7 for granite. Black granite is thus more desirable in these respects.

**Table 1—Physical Comparison of Surface Plate Materials**

| Material | Young's Modulus (psi x $10^6$) | Modulus of Rigidity (psi x $10^6$) | Heat Capacity (joules/g) | Thermal Exp. Coefficient (in./in./deg. C x $10^{-6}$) |
|---|---|---|---|---|
| Granite* | 3.9 to 8.8 | 2.3 to 4.0 | 0.65 | 8.0 |
| Black Granite | 8.45 to 13.6 | 4.5 to 5.2 | 0.72 | 5.4 |
| Cast iron | 12 to 14 | 5 to 6 | 0.45 | 10.0 |

*Pink to light grey

**Thermal Properties:** Mechanical changes due to temperature fluctuations may result from thermal expansion. The extent of such expansion is determined by the rate of response to temperature changes and the amount of expansion per degree of change. The first of these is a function of the heat capacity (also termed specific heat) of the material. Heat capacity is defined as the quantity of heat energy required to raise the temperature of a given weight a given amount. High heat capacity results in slow response to temperature changes and is thus a desirable property for surface plates. Average figures for the materials in question are given in the table. On this basis, black granite would maintain a more stable temperature than the other materials. The second factor is linear coefficient of thermal expansion. Figures given in the table are average values. From these data it is apparent that black granite is superior in this respect also.

**Surface Configuration:** The finished surface of a good surface plate is not a perfect plane since such smoothness would prevent easy sliding of tools and fixtures. Instead, the surface is one of minute hills and valleys. Slight inequalities in hardness of the various minerals of a rock are helpful in producing and maintaining such a surface. However, extreme hardness differences, as in granites which have quartz grains (very hard) mixed with feldspar (medium hard) and mica (soft), may result in uneven wear and abrasion of tools by hard quartz grains projecting above the average surface level. The minerals of most black granites have a rather narrow range of hardness, hence have been found more satisfactory in this respect.

**Summary:** Rock plates are believed to be superior to cast-iron plates due to the following features: they exhibit freedom from rusting or any other chemical alteration; lower response to temperature fluctuations; lower coefficient of thermal expansion; and are more resistant to wear.

As to the comparative qualities of different rocks, the following properties show black granite superior to pink and light grey granite: lower absorption; lower compressibility lower coefficient of thermal expansion; slower response to temperature change; greater strength; mineral composition more favorable for best surface configuration. Black granite also wears more evenly and is easier on tools.

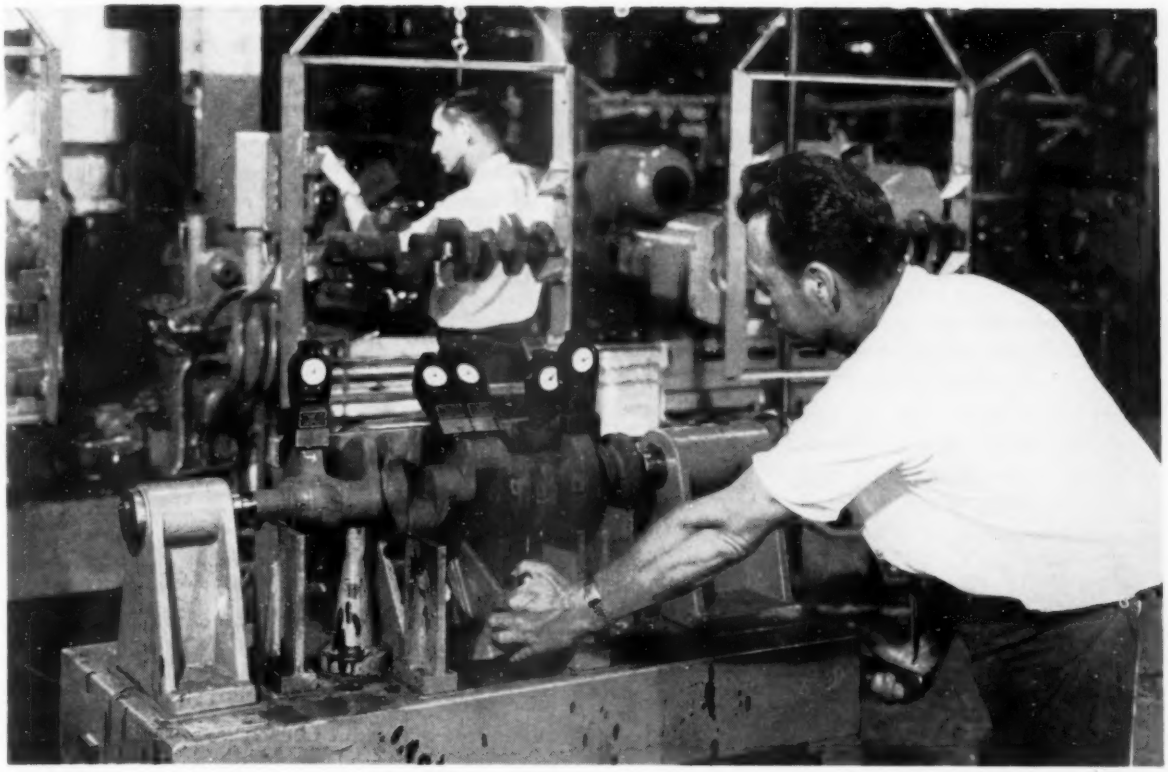


**Fig. 1. Costs of gaging programs can be considerably reduced when standard gage components are used as in this automotive application.**

# reducing gage costs

## *with standard components*

**By A. G. Davis***

**President**
**A. G. Davis Gage & Engineering Co.**
**Hazel Park, Mich.**

**Although industry standards normally result from the work of a technical society or association, individual companies can lead the way. In this instance, a single company has prepared a gage component standard program that can be a real service to industry.**

INTRODUCTION OF STANDARD gage components has made possible substantial savings for industry in both the designing and building of special purpose gages. The availability of completely standard commercial gages such as plug, thread, snap and ring gages enables industry to specify gages to perform specific gaging operations at a nominal cost. Although it is well understood that standard gages should be used whenever possible, the bulk of dollar volume expenditure on most gaging programs is for special gages designed and built to perform specific operations.

Designers have for years used standard components such as bushings, clamps, handles and other details in designing jigs and fixtures. Since it is

*Senior member ASTE Detroit chapter.

not necessary to design or build stock compenents, substantial savings have been effected.

It was recognized that availability of standard gage components could minimize unnecessary repetitive designing and reduce the number of special details required to build. Hundreds of specially designed gages were studied. Although the individual designs varied as to function and quality, there were features designed into each type of gage that varied only due to individual preferences of the designers.

This was a definite indication that development of standard gage components based on sound engineering practice could improve quality and function of special gages, *Fig.* 1. Further analysis and research showed that repetitive design practices were most prevalent in three basic types of special gages. Repetitive design features of each of these types will be outlined, showing how recognition of these factors led to the development of standard gage components that could be universally applied.

## Gages Utilizing Dial Indicators

Gages of this type are generally referred to as portable or built-up fixture gages. Engineering practice requires that the gaging motion be transferred by means of a gage pin. Due to infinitely variable part conditions, such as size of part and number of dimensions to be gaged, methods for locating, positioning and holding the part will always be left to the judgment of the designer.

The following features were found to be of a repetitive nature in each special design of this type and were determined to be readily adaptable to inclusion into standard gage components.

1. Method of holding the dial indicator with allowance for vertical adjustment to master settings.
2. Method of controlling overtravel of the gage pin to prevent jamming the indicator through careless operation or attempting to load oversize parts.
3. Method of controlling overtravel of the gage pin to prevent full-revolution misreading of the indicator pointer.
4. Method of incorporating a spring to assure equal gaging pressure to the workpiece and master set gage.

The next step was to determine how many additional desirable features could be included in the standard gage components to assure the utmost in operational performance for finished gages. It was found that guard protection for the indicator, interchangeability of all component parts and many fine adjustment features could be incorporated into designs of standard gage components. Designers were undoubtedly aware of the value of these features to the function of the gage but omitted them because the costs of designing and building them into each special gage were prohibitive.

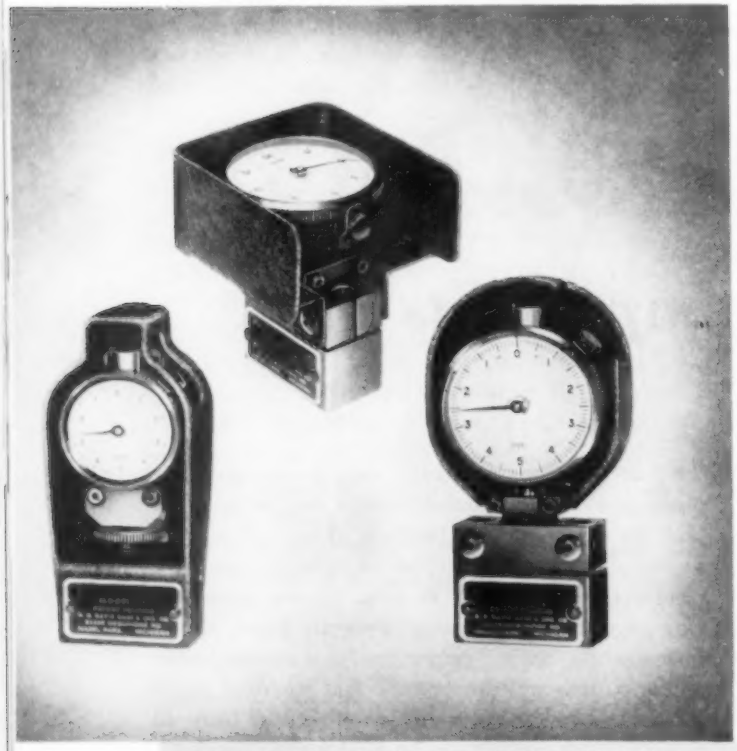


**Fig. 2. (above) Three standard models of gage mounting units are available so designer can specify size, make, graduation and type of indicator.**

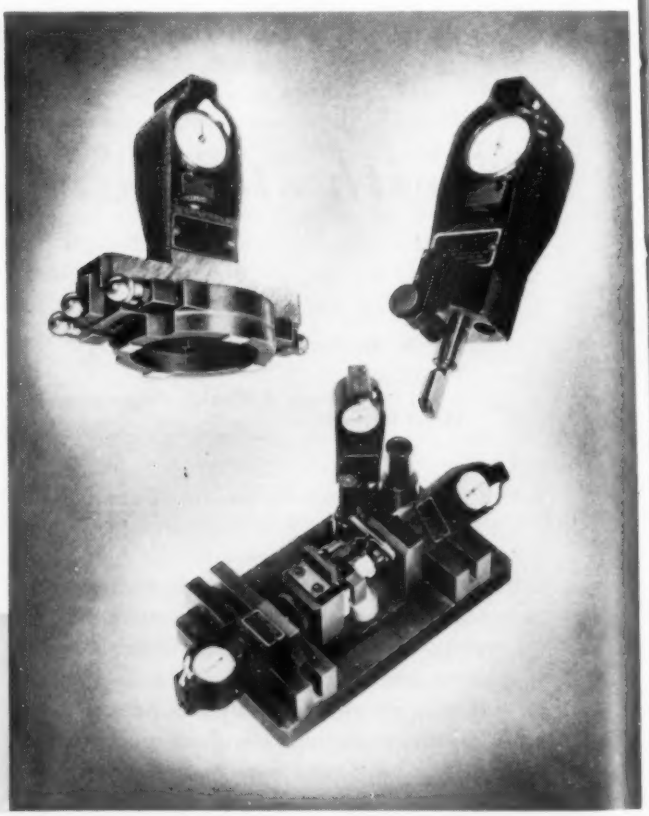


**Fig. 3. (right) Typical applications of standard gage units in special gaging applications. Standard units can be portable or fixed.**

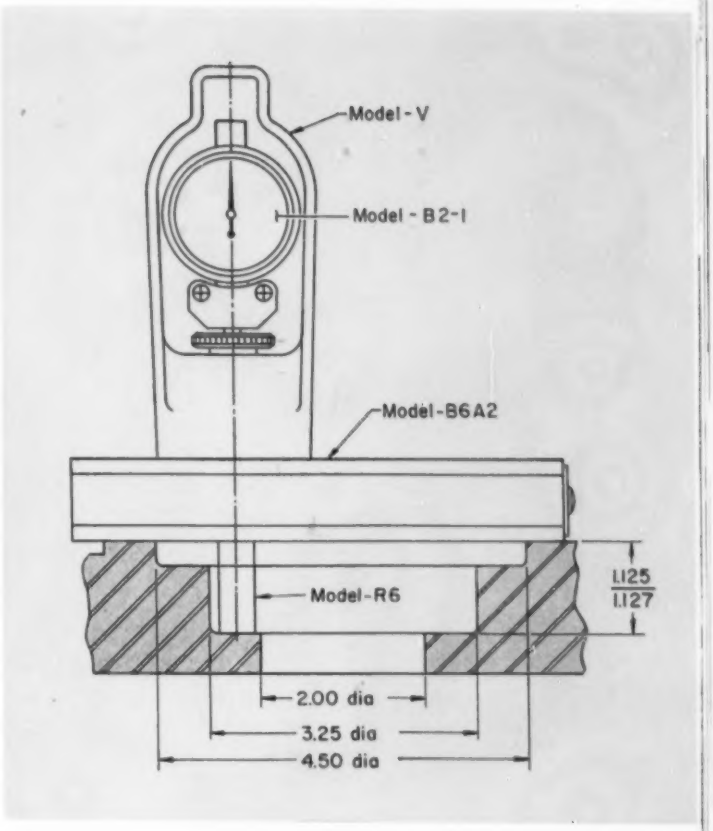



**Fig. 4. Combination of standard components to check 1.125-1.127-inch dimension. In addition to standard gage unit and commercial dial indicator, "B6A2" indicates bar component 6 inches long with pin located two inches from end and "R6" indicates pin component with an adjustable range of 1.000-1.200 inch.**

Three standard gage units, *Fig.* 2, have been developed to enable the designer to select a standard gage component that will accommodate the dial indicator of his choice. Size, make and graduation of the indicator are purposely left to the discretion of the designer so that he will not be limited just for the sake of standardization. Part tolerances, positioning the indicator for reading and individual company preferences dictate the make and model indicator required.

Gage designers now have available a selection of proven standard components for application in special designs where dial indicators are required. The designer can embody the essential and desirable features into a design, *Fig.* 3, simply by calling for the standard units as a detail of a gage drawing. Tracing templates of standard components are available to reduce drafting time. Prices of standard gage components represent only a small percentage of the cost necessary to provide such features if they were designed and detailed into each special gage design.

## Bar Type Indicator Depth Gages

A study of special designs for gages of this type revealed that, in the majority of applications, basic designs were quite similar. Most designs differed only to comply with part size and variable gaging dimensions. The four basic variables in designing gages of this type have been:

1. To design a means of holding the required dial indicator with allowance for vertical adjustment to master settings.
2. To design a bar of sufficient length to properly locate the gage on the part.
3. To locate the gage pin in the bar as determined by the location of the gaging dimension of the part.
4. To specify the length or range of the gage pin as determined by the gaging dimension.

It was then logical to conclude that all other design considerations, not affected by variable part conditions, were repetitive and varied only due to preferences of individual designers. This led to development of standard components designed to allow selective combinations to meet requirements dictated by part conditions.

Methods used to standardize dial indicator mounting units have been outlined. To allow for different lengths of bars, standard bar components were developed in a range of lengths to encompass those usually encountered. The process or design engineer need only specify the standard length that most closely satisfies this variable factor for each part to be gaged. Location of the gage pin in the bar is dependent on the location of the gaging dimension in the workpiece. Therefore, each standard length bar component is available with selective gage pin locations in increments of one inch from the end of the bar. These bars are coded by model numbers so that standard lengths can be specified with the gage pin location selective.

Length of the gage pin in each special design is determined by the dimension to be gaged. To avoid the necessity of individually designing and building special pins, 30 standard pin components have been developed in length increments of 0.200 inch. Because each dial indicator unit has a vertical adjustment range of 0.200 inch, each standard pin has infinite master setting capabilities within this range. No alteration is required on standard pins.

Through selective combinations of standard gage components, *Figs.* 4 and 5, it is now possible to order a complete bar type indicator depth gage directly from the drawings for the part to be gaged. When company policy requires permanent gage design drawings, preparation is aided by full-scale templates and as much detail as necessary can be traced on company paper. The presently available components do not cover all possible design conditions, but they will serve for a large majority of gaging needs.

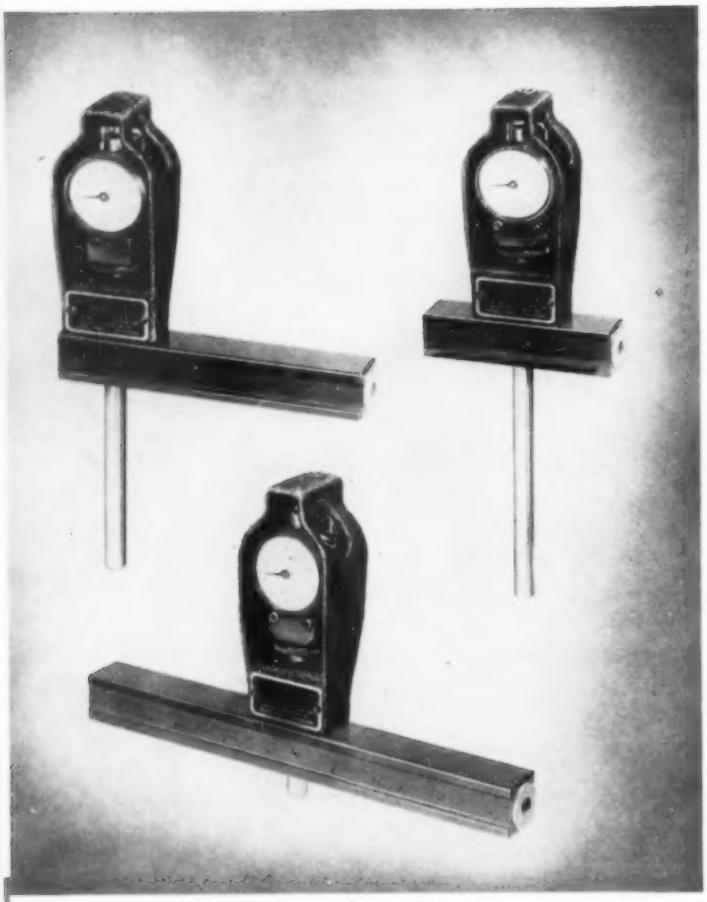


**Fig. 5. No alterations of standard components are required for fabrication of such special-purpose gages.**

## Flush Pin Gages

Extensive study of special flush pin gage designs indicated that much could be done to effect economy in both designing and building gages of this type. Basic characteristics of such gages naturally fall into two classifications, barrel type and bar type. Development of standard gage blank components for each type will be explained separately.

**Barrel Type Flush Pin Gages:** Gages of this type are used principally to check dimensions such as: depth of drilled hole, depth of counterbore, depth of recess or keyway, diameter of countersink and height of stud. Analysis of designs of this type showed that the principal variable feature of each design was the diameter of the gage pin. This dimension was determined to a certain extent by the diameter of the hole or opening in the part to be gaged. In the case of countersink gages, pins are selected larger in diameter than the maximum diameter to be gaged.

It was evident that the major cost of each special design represented repetitive designing that had no actual bearing on dimensional requirements of the gage. The following noncritical dimensions in each design were taking unnecessary design, detailing and checking time: diameter of barrel; length of barrel; type of knurl; chamfer; location and method of retaining gage pin in barrel; location, depth and length of retainer flat in gage pin; steel and heat treating specifications; and tolerances for barrel hole and pin diameter.

It was concluded from this study that availability of standard gage blanks, selective by standard pin diameters and lengths, would lead to economy. A majority of conditions could be met by a standard line of blanks. Some companies had adopted individual design standards for flush pin gages but full effectiveness was not realized because the designs had to be drawn and detailed for manufacture, and each gage had to be built as completely special since no standard gage blanks were available.

Where standard gage blanks are applicable, they can be selected by model number and called for as a detail of the drawing. Drawings can be traced

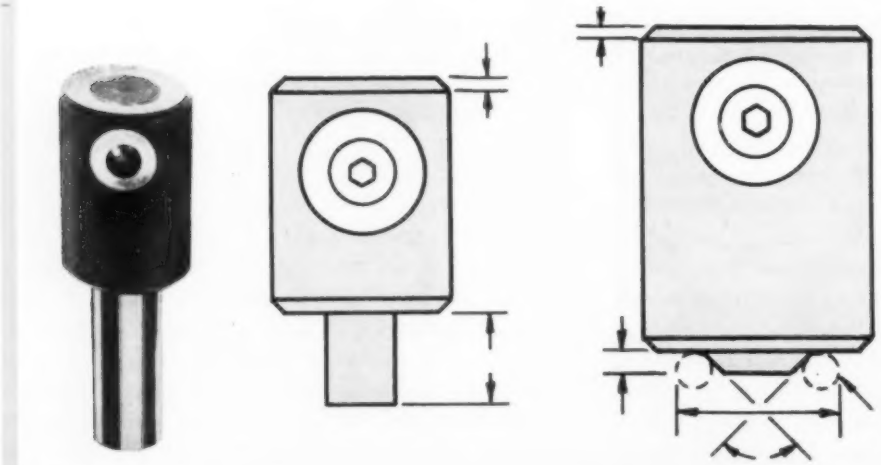


**Fig. 6. In addition to specifying the standard barrel type flush pin gage model number, the gage designer need only indicate dimensions as shown.**

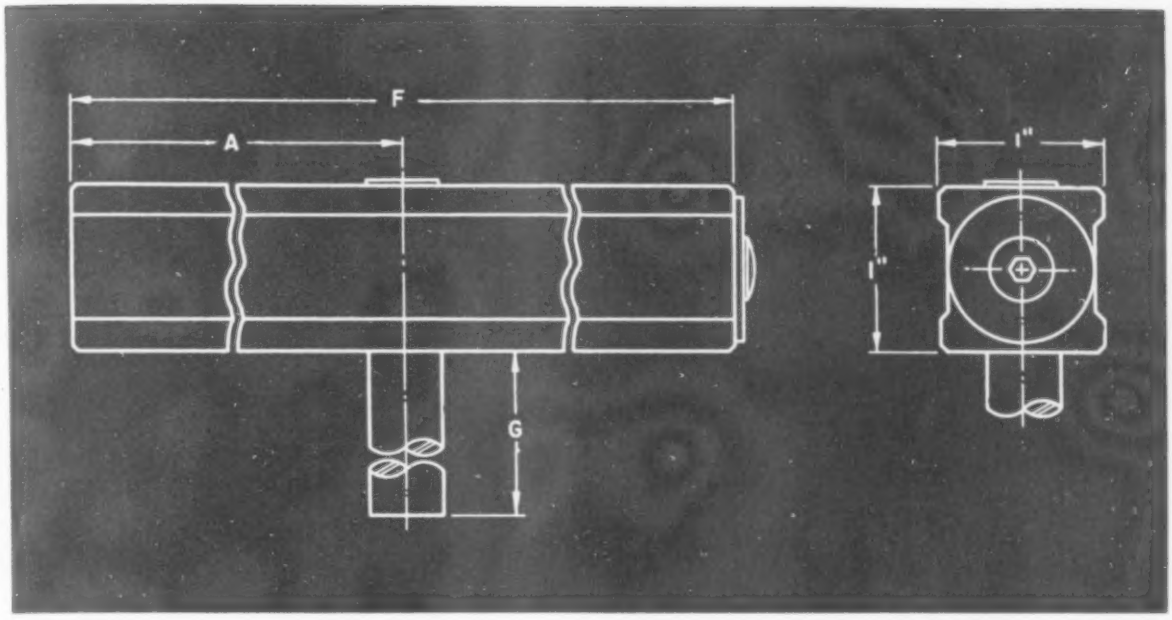



**Fig. 8. Bar type flush pin gage blanks are available in selective combinations of "F," "A" and "G" dimensions. Only gaging range of pin and step tolerances on pin or bar need be dimensioned.**

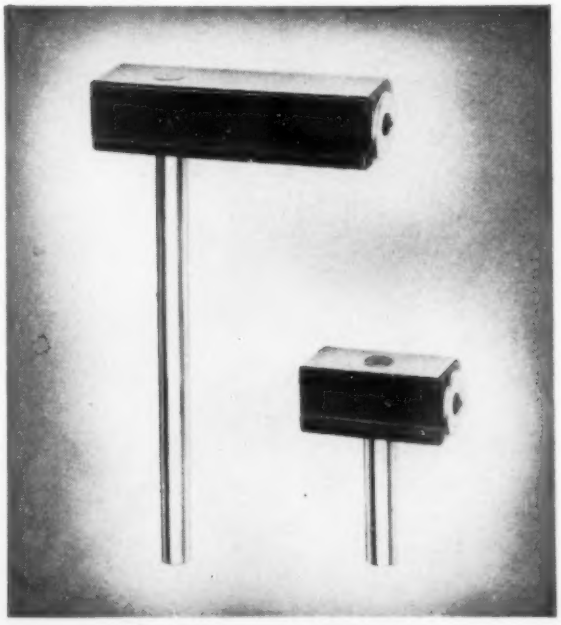
from templates for purposes of gage records. Standard gage blanks are completely hardened and ground, and require only dimensional grinding as determined by the gaging requirements. The drawing need be dimensioned, *Fig.* 6, only to indicate the alterations required in the standard blank.

**Bar Type Flush Pin Gages:** Development of standard blanks for application in designing and building gages of this type was based on the conclusion that: length of bar could be standardized in length increments of two inches; location of flush pin in each standard length bar could be selective in one inch increments from end of bar; diameter of all flush pins could be standardized and interchangeable for all bars since pin diameters are not a factor in gages of this type; and lengths of gage pins could be standard in increments to cover general lengths with sufficient stock to allow grinding to the required dimension.

Standard components are available completely hardened and ground with the exceptions of the gaging range of the pin and the step tolerances on the pin or bar, *Fig.* 7. When company record drawings are required, they can be prepared from tracing templates and only the variables need be dimensioned, *Fig.* 8.

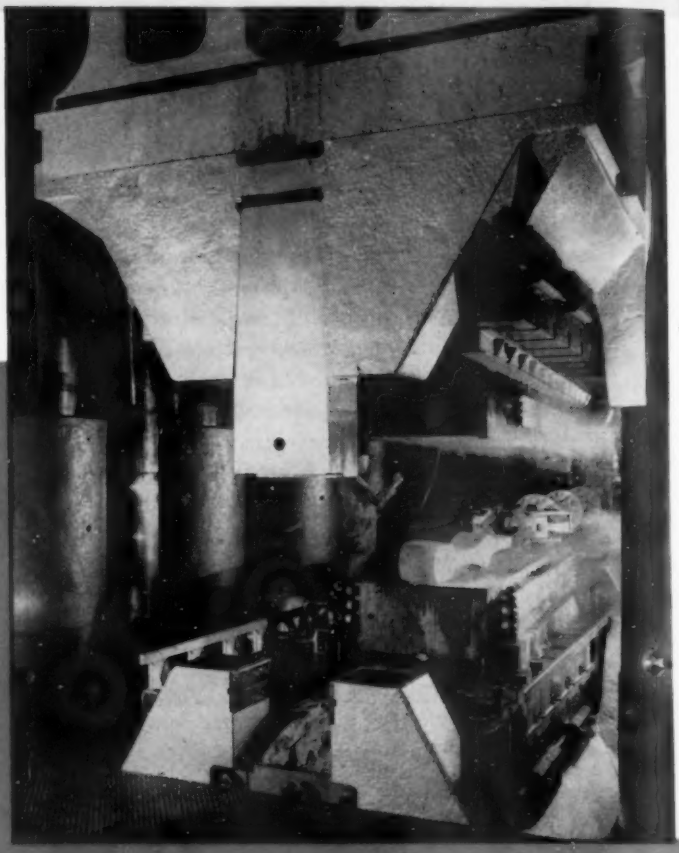
The gaging principles outlined are not theoretical. They have been proved in widely different gaging fields with the common result that designing and building time have been saved. In addition to the economy of using such standard components, desirable features that had previously been omitted because they would have increased costs are now available without expenditure.

**Fig. 7. Typical bar type flush pin gage blanks ready for finish grinding for a specific application.**



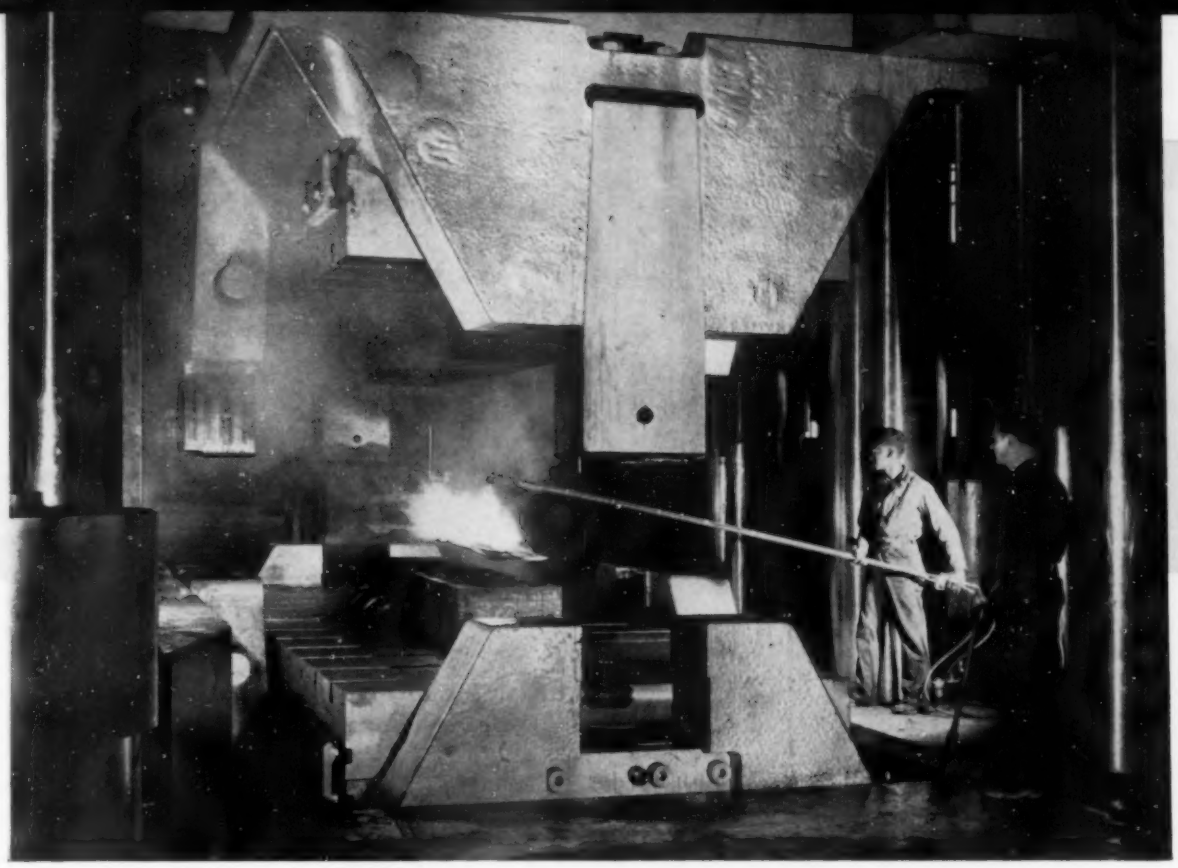
Braidless, plastic-insulated cable, used by Packard Electric Div. GM, is finding use throughout the auto industry. The plastic cable has a high degree of resistance to abrasion and is impervious to the effects of grease, oil and antifreeze. Its smaller overall size reduces the bulk of wiring assemblies. By eliminating need for braid and lacquer insulation, the cable does not support combustion and is virtually fireproof.

SIMPLICITY of control panel belies complexity of the 50,000-ton press's hydraulic and electric system as operator stands ready to actuate ram for first forging operation. Billet heating furnaces in the background, of gas-fired type, pre-heat forging blanks in four controlled heat zones over slat-type conveyor hearths.

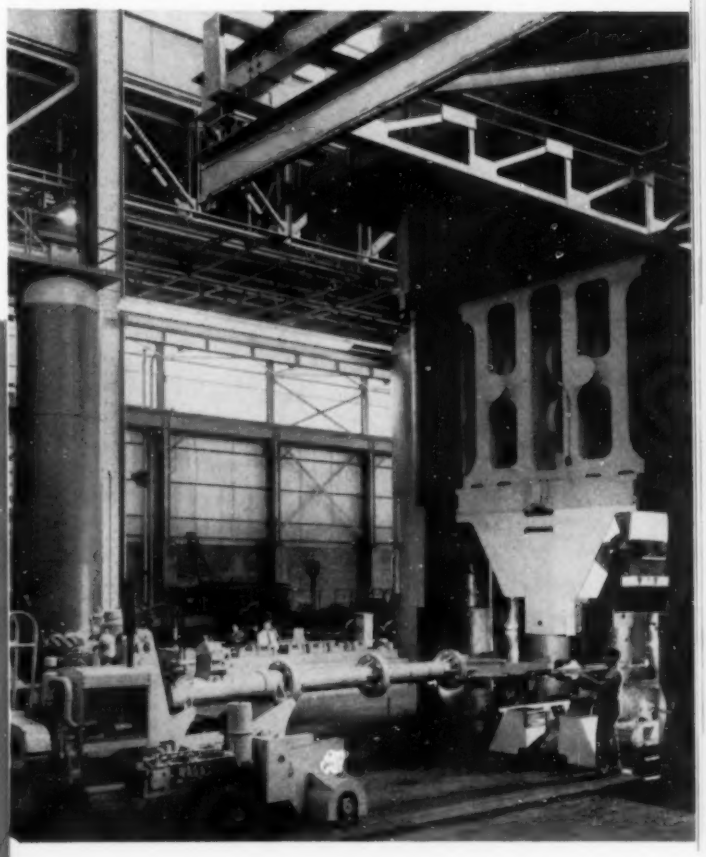


MECHANICAL MANIPULATOR is used to remove precut billet from furnace and position it on the die, which has been preheated to operating temperature. This is first of two forging operations required.

# TOOLS at work

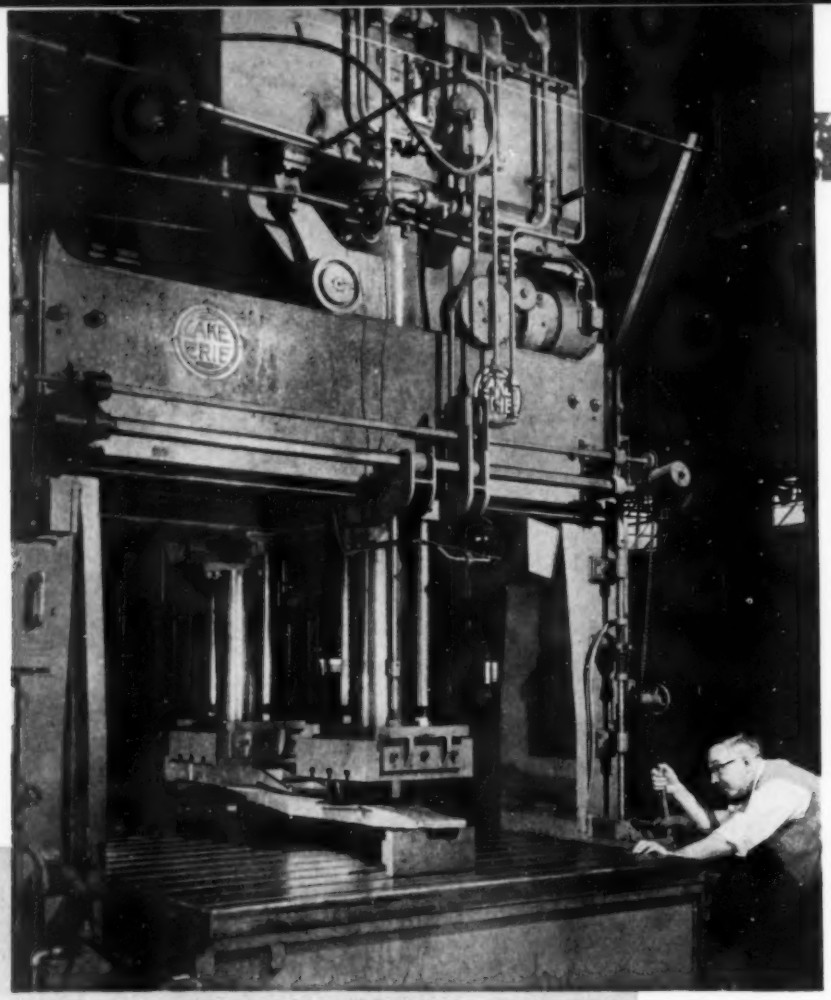


FINISHING forging operation on an aluminum aircraft wing spar is preceded by spraying semiformed blank with lubricant. Although die and forging stock temperature ignites the lubricant, the residue aids in metal flow.



MANIPULATOR removes wing spar forging from press. Several of the press's eight main operating cylinders are shown. At left is one of the accumulator tanks where water is stored under pressure for operating press. Of 7,164 tons total press weight, 2, 082 tons move during the press stroke.

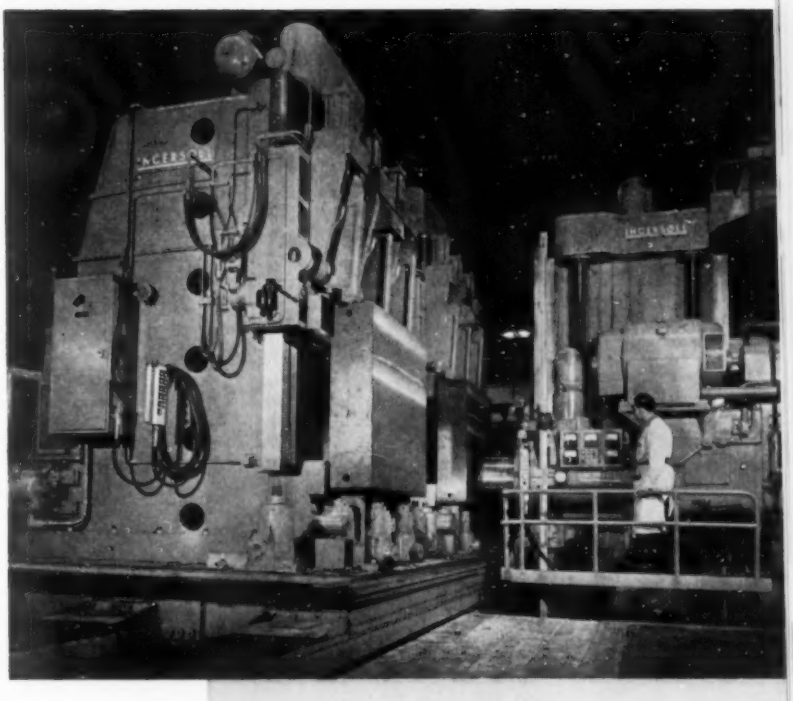
**Accompanying views picture progress in production of large forgings as exemplified by the heavy press plant in Cleveland, O. Representing an important part of the USAF heavy press program, this plant was recently made operational by Aluminum Co. of America.**




TO ASSURE dimensions within specified tolerances the aircraft wing spar forging is straightened in special press. Thin ribs and webs are being produced in precision forgings such as this with small fillets and draft angles from 0 to 1½ deg. Little or no machining, or other sizing operations are ordinarily required other than trimming of flash and straightening.

BATTERY of solution treating furnaces heat-treats heavy press forgings after completion of metalworking operations to secure optimum physicals. The quench bath is located directly beneath the hearth, allowing almost instantaneous quenching. After solution treatment the forgings are transferred by car to aging furnaces.

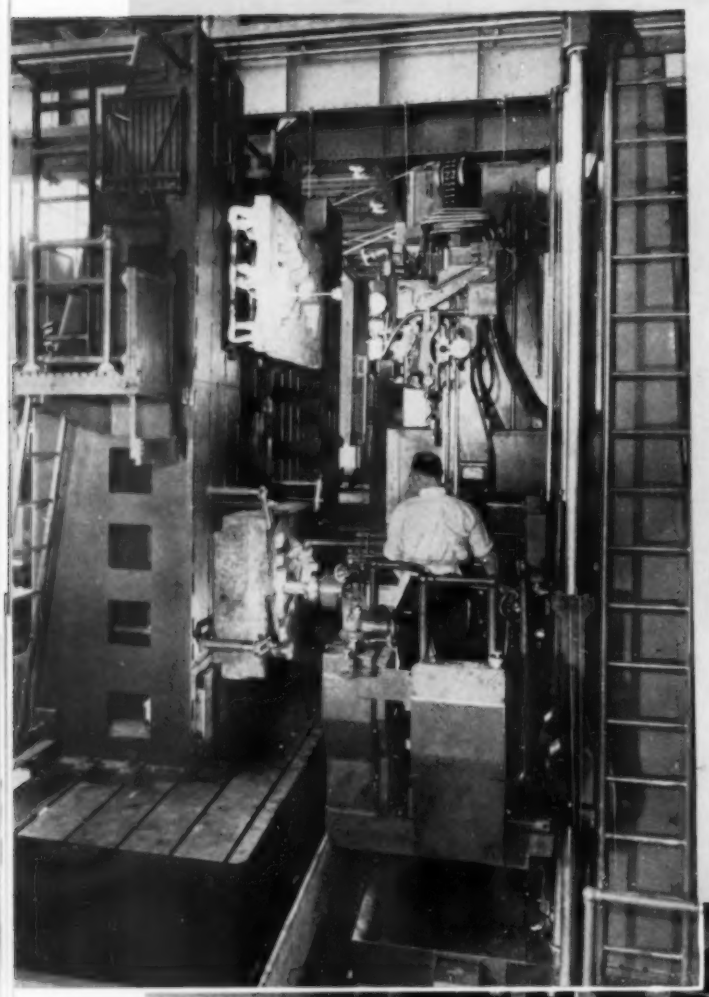
# TOOLS at work



DIES for the heavy presses are produced in adjacent die shop. Die blocks are shanked —forging cavity face of the block is machined smooth— by face miller.

QUALITY CONTROL of precision forging includes this ultrasonic reflectoscope inspection with parts immersed in water. In addition the part is checked dimensionally and for hardness.

# TOOLS at work



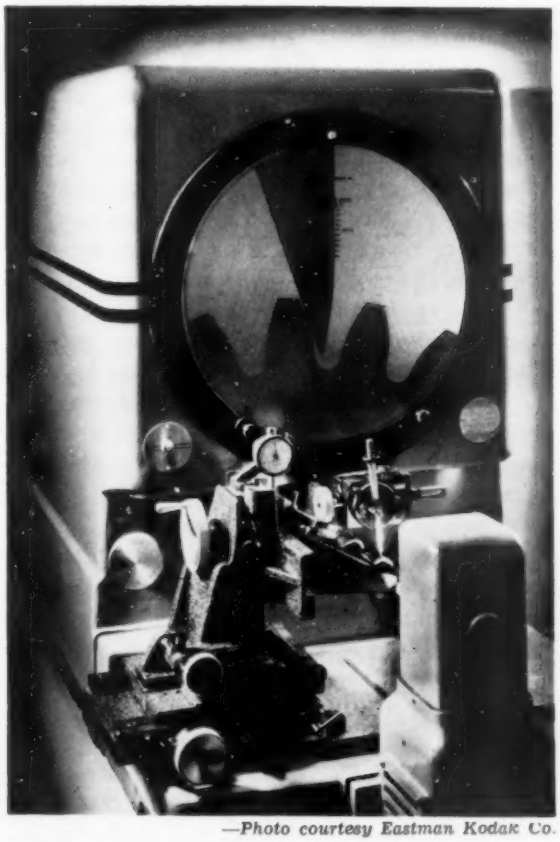
ONE OF 12 duplicating die sinking machines cuts forging impression in die block using tracer control. Die block faces up to 10 x 28 feet can be handled in the shop on horizontal spindle machines.

TRACER CONTROL on 84-inch vertical boring mill simplifies duplication of die shape of plaster model.

# Finishes for Metals

## Processes and Equipment

By Robert A. Wason
Associate Editor



—Photo courtesy Eastman Kodak Co.

**Fig. 1. A good combination of finishes gives this contour projector the look of quality. Because the finishes have been properly applied, they will protect the metals for a long service life.**

**No single article can cover the many combinations of finishes, finishing processes and finishing equipment. This article, the final in a series, will outline the high points of the subject and give the process engineer some new ideas on metal finishing and how it is done.**

WITH GOOD METAL FINISHING equipment, a modern finish and operators with sufficient experience, one thing must still be done before process sheets can be prepared. Labels and instruction manuals must be read thoroughly and understood. Various finishes must be applied to the work within certain times after they have been mixed or reduced for application, conditions of temperature and humidity must be controlled within limits during application, and post-application steps should be followed.

If product quality and appearance are desired, *Fig.* 1, it is frequently advisable to draw on the experience of finish, equipment and process suppliers. Such organizations can quickly rule out the materials and equipment that will not do the required job and can suggest modifications to others that will do the job best.

The cost of applying a coating is normally much higher than the cost of the coating materials. Therefor, as much or more consideration should be given to selection of the methods as is given to selection

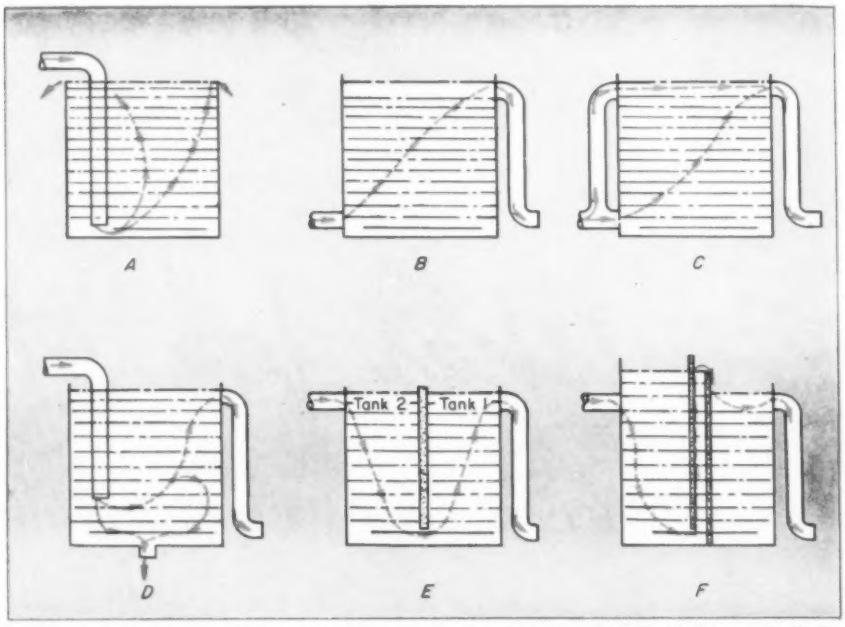
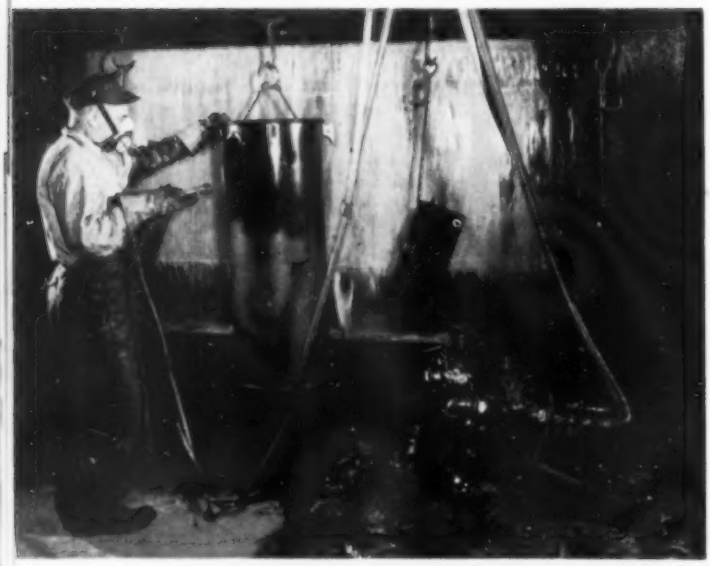



**Fig. 2. (right) Rinse tanks can be as simple or complicated as necessary to meet standards of cleanliness and water consumption. Elements of the designs can be combined for greater effectiveness.**

*—Drawings courtesy E. F. Houghton & Co.*

**Fig. 9. (below) Standard spraying operation against a waterfall to collect the overspray, using an individual mixing tank. A dark green dye is used in the mica-base paint so operator can determine coverage. The dye fades away during infrared drying.**



*—Photo courtesy Westinghouse Electric Corp.*

of the materials. Organic finishes can be applied by brush, roller, dip, spray, flow, knife, tumble, silk screen and electrostatic methods. Application by brush is the slowest; the others are high-production methods. If a finishing line is already established, the coating may have to be selected with that process in mind. If the finishing department is flexible, it is better to select the coating that is best and build up the proper finishing system.

For spraying, coating should be capable of atomization and wet enough to level. For dipping, the coating should give a uniform film thickness without sag or run. For flow coating, viscosity and solvent evaporation rate are the most important characteristics. Quick setting of a finish prevents dust collection that can mar a finished product but if it is too quick, proper leveling may not occur. Because of process variables, finishes should be purchased on coverage per gallon rather than price per gallon figures.

Application and processing characteristics are important in the over-all cost picture. If an air drying finish will be satisfactory, it would be foolish to specify a baked finish that would require large expenditures for equipment. If fast production is required, a baked finish or a rapid drying lacquer would prove most economical for long production runs. Life of the product being coated must also be considered. Refinishing can be an expensive operation because of the time and labor involved.

Japans are normally applied by spray, dip or brush directly to the base metal. Although such finishes can be air dried, they must be baked to obtain full hardness. Rubbing is required between successive coats. Oleoresins, oil-base coatings, can be applied by spray, dip, roller or brush. They can be air dried or baked, with baking resulting in better hardness and corrosion resistance. Phenolic coatings are applied by spray, dip or brush and are given a high-temperature, 300 to 350F, bake. Lacquers are normally sprayed because they set rapidly but they can be applied by dipping, rolling or brushing. Such coatings air dry fast but can be forced with a 180F bake.

Standard alkyd finishes can be applied by spray, dip, roller or brush. Differences in baking techniques can give special texture effects. Some type of bake is necessary with all of the alkyd-amine coatings. These finishes are usually sprayed or dipped. Styrenated alkyds are applied by spray, dip, roller or brush and are available in air dry-

ing or baking types. Silicone formulations are used for sprays or dips but must be baked at temperatures between 350 and 425F. Vinyl coatings are applied by spray, dip or brush. Such finishes air dry but are more often force dried to give better adhesion.

**Metal Cleaning:** Simplest but least effective method of cleaning is by hand washing or swabbing surfaces with a brush using petroleum solvents and organic solvents such as toluene, naphtha or carbon tetrachloride. Such methods do not remove oil or grease but rather spread it in a thin film over a greater area. Also, such solvents introduce toxic and fire hazards when used in an enclosed area.

Cleaning by immersion of parts in a tank of solvent is not too effective since soils rapidly contaminate the tank. Oil and grease collect as a film floating on top of the solution and are picked up by the part as it is withdrawn. The surface of the tank can be skimmed periodically but this does not help much.

Soak tank cleaning is the simplest method of alkaline cleaning. The solution is kept at a rolling boil to cause agitation. More agitation can be obtained by using baffles, steam jets, circulatory heaters, propellers, pumps and movement of the workpiece. Air agitation should not be used because it will cool the solution and its carbon dioxide content might set up chemical reactions with the alkali. This would slow cleaning and shorten the life of the solution. Soak tanks can be heated by steam coils or by immersion type gas burners. Parts should be thoroughly rinsed after soaking.

Spray cleaning is old but solutions have been steadily improved. Such cleaners depend not only on the impinging effect of the water and the destructive effects of alkaline components but have added penetrating solvency and emulsifying powers due to added organic compounds. Conveyorized washing machines can be used to speed cleaning. Such equipment includes washing, rinsing and drying operations. Cleaners with synthetic detergents cannot be used in such equipment because of excessive foaming.

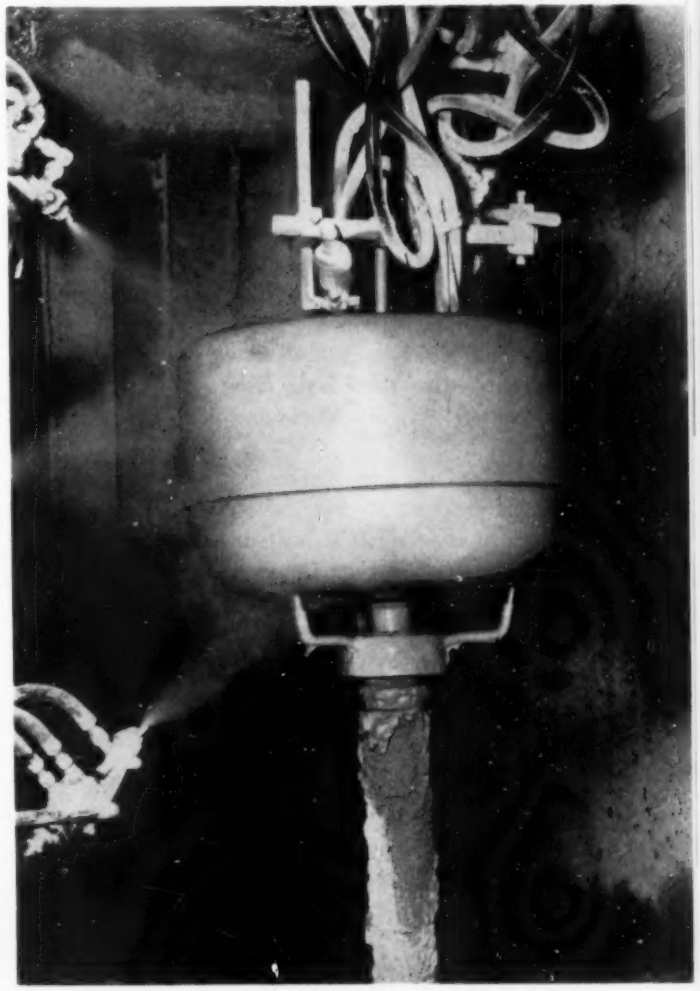
Various solutions and equipment can sometimes be combined with good results. A typical solution includes both organic and inorganic solvents that can carry a high proportion of soil in solution befor any is thrown back on the work. Such solutions are now made that do not introduce fire hazards, that inhibit corrosion and that are not toxic. Spray washing equipment can include rinses, and blow-off steps with both room temperature and heated air.

Alkaline tank cleaning can be speeded by using electricity. The same cleaning compounds can be used but faster cleaning results through liberation of either hydrogen or oxygen gas bubbles at the work surface. These bubbles throw off the soil. Electric current also causes some charged particles of soil to unplate from the workpiece. There are three methods possible. Each is more expensive than a simple soak but each is also more effective. When work is put on the cathode, it is termed direct cleaning; when on the anode, it is reverse cleaning. Cathodic cleaning is more widely used but anodic methods are increasing in popularity.

Cathodic cleaning is more advantageous because twice as much gas is formed on the work. However, any metal in the solution will plate out on the workpiece. Metals can't plate out with anodic cleaning but prolonged cleaning can lead to an etch. Combination installations use a long cathodic cleaning period with a short anodic step to remove any smut or metal that might have been plated on the

**Fig. 4. Automatic spray machine used for application of porcelain enamel to washing machine tubs speeds finishing and improves quality.**

*—Photo courtesy Ferro Corp.*



work. Such reveral is especially useful when cleaning nonferrous metals. It should be borne in mind that gases that aid combustion or are highly explosive are liberated by this cleaning method. Proper ventilation is a necessity.

In vapor degreasing equipment, parts are held for about 30 seconds in the vapors of heated chlorinated solvents, trichloroethylene or perchloroethylene. Vapor condenses on parts and streams off

*—Drawing courtesy Binks Mfg. Co.*

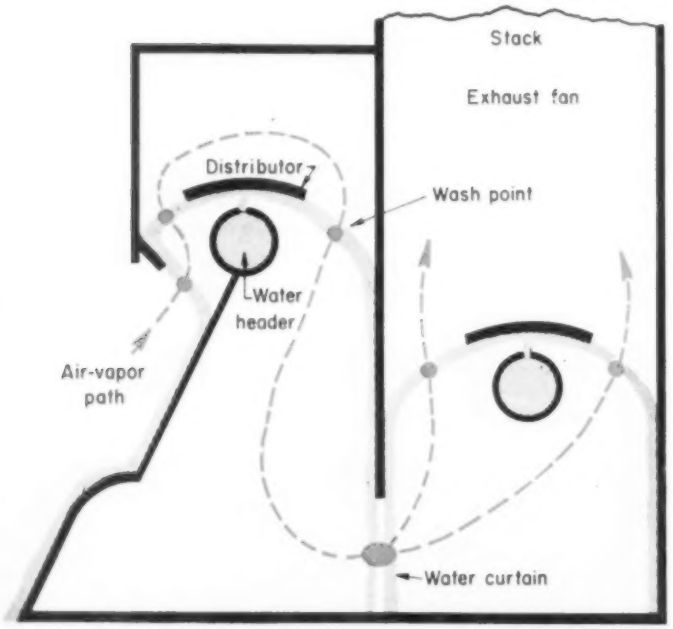



**Fig. 5. Fans draw the overspray through five water washes before exhausting to the atmosphere in this multiple wash spray booth wall.**

carrying the soil with it. Not all types of greases, oils and drawing compounds can be removed in this way because some of these materials break down the solvents. Also, there is the danger of hydrolysis and formation of hydrochloric acid if moisture is present.

When soils are inorganic and cannot be removed by normal chemical cleaning methods, mechanical cleaning is indicated. Equipment for such processes ranges from simple hand-held wire brushes to complete metal shot-blast cleaning machines. The latter equipment gives good results and is designed for operating ease and economy. In one instance, by switching from pickling, power sanding and hand methods to blast cleaning, paint peeling problems were eliminated.

A steam gun is convenient for cleaning parts that are too large for immersion in cleaning tanks. Such guns are normally portable so they can be used where needed. The steam is usually fortified with alkaline or emulsion cleaners.

If an acid etch is part of the cleaning cycle, it should be remembered that the water must be poured into the tanks before the acid. Tanks for such application should be lined with lead and can be heated by lead metal steam coils. Crocks or ceramic vats can be used with externally heated water jackets.

Proper rinse tank design depends on the amount of contaminant retained on the work as it is removed from the cleaning solution and the maximum salt concentration that can be permitted in the rinse tank without harming the pieces. The simplest design is shown at *A* in *Fig.* 2. Water comes in at the bottom and overflows at the top. An improvement is shown at *B* where the entire cross section of the tank can be used. Because of the overflow in this design, a large surface area of the water can be removed and chances for contamination are lessened.

Where floating material can be a major problem, the design of *C* is good because the jet of water effectively sweeps the surface into the overflow. Tank design *D* is where heavy precipitates or particles of scale are encountered and won't carry to an overflow. The bottom drain is large enough to carry off the particles without lowering the water level.

When it is necessary to conserve water, design *E* can do a good job. In this simple series system with underflow, the work is rinsed counter to the water flow. Workpieces are immersed first in tank 1 and then into tank 2, the cleanest water. If work is bulky, it can cause water to back up from tank 1 to tank 2. Design *F* effectively prevents backup but maintains water consumption at a low level. The same principles can be applied to multitank systems to achieve the desired cleanliness with a realistic water consumption.

**Manual Application:** Applying finishes by brush is not a high-production method but it is frequently necessary. Enough paint is put on by brush so that proper care and use of brushes should be known. Short, uncaught bristles should be removed from a brush by striking the bristles against the spread fingers of the hand and by twirling it between the hands. Loose bristles can then be picked out.

A new brush should be soaked in linseed oil for 72 hours, unless it is to be used for resin-emulsion-water thinned paints, shellac or varnish, so the bristles will not absorb the pigments and make cleaning difficult. Dried, absorbed paint, especially with hog bristles, will stiffen the action of the brush. It is also a good idea to dip the brush in the thinner used with the coating just before use. Excess thinner should be shaken from the brush. This reduces the cleaning chore.

A standard paint brush should not be used with varnish or lacquer. Special brushes are available that give much better results. Initially, synthetic

bristles did not hold paint as well as the forked natural bristles but now the synthetic types are available pointed and roughened. Synthetic bristles outlast hog bristles from three to five times.

Brushes should be dipped in paint only half the length of the bristles because it is difficult to clean the heel of a brush. For resin-emulsion paints, the brush should be dipped all the way to the ferrule to prevent paint that has backed up into the heel from air drying. Excess paint should be removed from the brush by tapping it lightly against the inside of the paint pot. A smooth, rimless paint pot will not cut the bristles of a brush the way a paint can rim will.

Drawing a brush edgewise across the paint pot to remove the surplus paint can reduce brush life and cause fingering. Fingering, when the bristles gather in bunches and will not stay separated, can also be caused by improperly breaking in the brush or using it edgewise when painting inside angles. Brushes that have been stored in water, which causes them to be flexible unless dried and combed, and those that have paint hardened in the heel are also subject to fingering.

For narrow work, especially pipes, a narrow brush should be used so the entire edge is in contact. A wide brush will fishtail if used on narrow work. Fishtailing is the uneven wear of softer inside bristles and can be avoided by proper brush use.

In use, the brush should be fairly wet and the coating should be worked to a wet edge with all finishing strokes in the same direction. Overbrushing should be avoided. This is especially true with aluminum paints because leafing starts immediately. Any attempt to retouch or go over aluminum paint results in blemishes caused by alteration of the leafing structure. Where extreme smoothness is desired, the finish should be strained after mixing and precautions should be taken against dust during drying.

Brushes can be kept wet in good condition for short periods by working out excess paint then rinsing them in mineral spirits, if oil paint or varnish is used. They should be left immersed in mineral spirits so brush weight does not rest on bristle tips. To store wet for longer periods, excess paint should be worked out and bristles immersed in a mixture of ½ raw linseed oil and ½ turpentine.

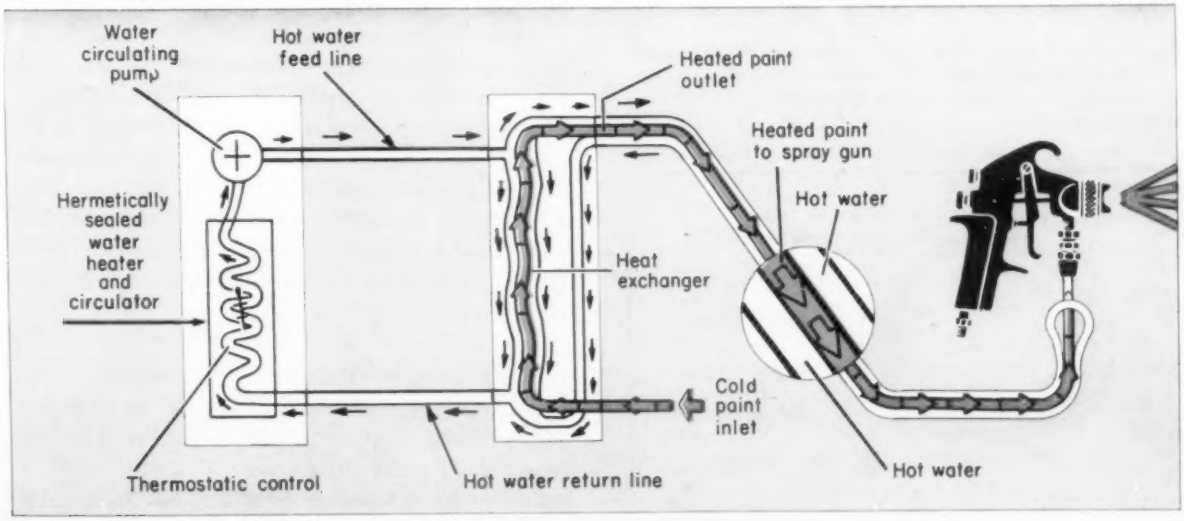
Brushes used in rubber base paint, water paint, shellac, lacquer or fast-drying synthetic enamels and varnishes should be stored dry. To store dry, brushes used in oil paint or varnish should be immediately cleaned in paint thinner, turpentine or mineral spirits. There is no need to wash brushes in soap and water if they are thoroughly cleaned. Solvent should be shaken out, bristles should be combed straight and brushes should be wrapped in newspaper or aluminum foil. Natural bristles are subject to attack by moths and should be suitably protected. Brushes for other types of coatings should be cleaned immediately in thinners used with the coating.

Brushes of natural bristles, nylon, Cleac or mixtures of these materials may be cleaned immediately after use in oil paint or varnish with any of the usual solvents such as thinners, turpentine, mineral spirits or naphtha without harm. Highly alkaline cleaners can injure natural bristles and strong acid, alcohol or phenolic solutions can injure synthetics.

Roller coaters are finding increased popularity for flat surface finishing because they permit fast economical application. Rollers are available with

**Fig. 6. Paint heating system recirculates hot water up to the spray gun so that finish is sprayed at correct temperature.**

*—Drawing courtesy The DeVilbiss Co.*



pressure systems so that the finish is fed to the roller as it is required. This increases the application speed.

**Dip Coating:** Dipping products into the finish is a simple method and requires little equipment. For high production, the system is usually conveyorized with a sharp dip being made over the tank of finish. The excess drips off as the conveyor goes over a drain area. Disadvantages of this method include the fact that cavities may trap air and not be painted or they may hold the finish and cause large dragout from the tank.

In aluminum paints, there is evidence that a dipping process does not remove aluminum pigment from a tank in the same ratio that it is found in the tank. Settling of the pigment in the tank occurs fairly rapidly and its contents should be remixed at regular intervals. Intensive pumping, however, should be avoided with aluminum finishes. The only known control for this condition is determination of the best withdrawal speed and close adherence to this speed.

Beads or tears tend to cling to edges of dipped parts. These can be removed by spinning the parts or by electrostatic detearing. A variation of this can be done with small parts. A collection of small parts can be placed in a basket and then dipped in the tank. The basket of parts is allowed to thoroughly drain and then it is placed in a form of centrifuge. Excess paint is then whirled off the parts by centrifugal force. This method works best and gives the smoothest coating if the direction of the centrifuge is reversed at least once.

**Paint Spraying:** The most used method of applying finishes to metal parts is the standard spraying process. An air stream picks up the finishing material, atomizes it and transports it to the workpiece, *Fig.* 3. Thinners are normally used to reduce the viscosity of the finish so that atomization will be complete. There is a vast array of equipment that can be selected for paint spraying and selection of one type over another can be made only after tests. For example, an imported spray gun is claimed to be completely mist free and can apply materials without thinners. Spraying systems are based on syphon or pressure nozzles.

When spray painting, consideration should be given to masks. These metal forms can be of great help in applying designs or names, and in keeping paint from places where it isn't wanted. Some masks are combined with automatic rotating equipment to give tremendous production rates.

When material being sprayed is extremely abrasive—incorporating sand, etc.—a high-pressure spray gun with a replaceable rubber tip should be considered. This tip resists wear, gives an accurate pattern and can be replaced easily.

Spray equipment ranges from single color portable units, with the pressure tank mounted on a dolly, to huge central paint departments with multiple colors pumped to all points of the plant. In small operations or with frequent color changes, it can be advantageous to use a barrel pump which saves all the time and fuss of transferring paint from its original container. One such system uses an air motor to safely build up required pressure right in the barrel.

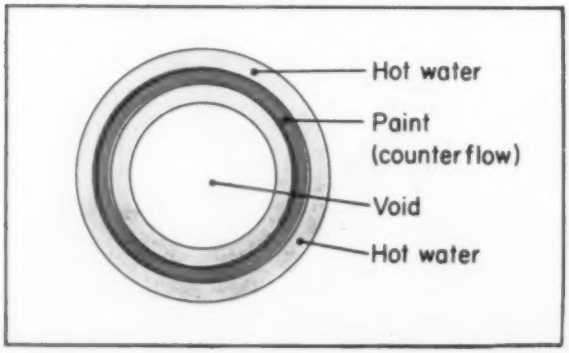
Application of porcelain enamel is an exacting process that cannot be completely described in this article. However, although application of spray techniques has been slow in this field, equipment and techniques are increasing in effectiveness, *Fig.* 4, and reducing costs.

A new type of spraying is done without air. The method is based on centrifugal force. Paint is pumped into a revolving bowl and centrifugal force causes the paint to go to the outside edge. When sufficient paint is built up, the layer hits a distributor which is free to turn and which is set at an angle to the bowl. The distributor throws the paint out from the bowl. Since the system is mechanical, no special spray thinners are needed. Several bowls are aimed at the workpiece inside an enclosure. The chamber becomes saturated with mist and coats the object. Overspray drips down the chamber walls and recovery is almost 100 percent. This system is used only for continuous painting, as with long sections of piping.

**Paint Booths:** Because of the dangers of toxicity, volatility and flammability of most paints and solvents, painting should be done in a special area. Metal spray booths are frequently used. A simple booth is open at front and has an exhaust

**Fig. 7. Concentric rings form a heat exchanger that can transfer efficiently by layers. Capacity of the unit is only 3 oz. but it has no trouble supplying one spray gun.**

*—Drawing courtesy Fostoria Pressed Steel Corp.*



fan to remove the solvent vapors. Turntables, manual or part of the conveyor, enable spraying of all sides of the work. To prevent build-up on the booth walls, they can be covered with paper which is later removed and burned. Peelable plastic compounds are better and can be sprayed or brushed on.

*—Photo courtesy Westinghouse Electric Corp.*

**Fig. 8. Prime coat is flowed onto transformer tanks so that crevices between the tank wall and projection-welded parts will be filled.**

When loaded, such compounds are easy to remove.

For high production operations, water curtain booths are designed. The back wall of the booth is inclined slightly forward, *Fig.* 3, and a steady stream of water flows over it. The water can be recirculated. An exhaust fan pulls all fumes and overspray into the water. In some instances, the paint can be recovered from the settling tank. Special compounds can be added to the water to prevent the paint from remaining sticky and clogging the equipment. Putty-like masses form in the tank and can be removed easily. Different compounds are formulated for different types of finishes. Extensive systems can mechanize removal of the overspray from the water. When the particles float on the surface, a belt moving up through the surface continuously removes them. Particles can be scraped from or will fall off of the belt.

Where quantity of overspray is liable to be large, multiple washes, *Fig.* 5, can be used. For high-quality finishes, the booth can be a complete enclosure kept under slight pressure with filtered air so no dust can enter. Many booths are tied into automatic conveyor systems with fixed or movable spray guns so they cover complete objects and only spray when work is in the pattern area.

For parts that are too heavy to be conveniently handled in booths, they can be sprayed while standing on heavy grids set into the floor to support them. A strong exhaust through the grid structure draws the fumes downward. A sharp angle turn under the floor deposits the entrained paint into a water trap.

**Hot Spray:** Paint department bottlenecks can frequently be broken with the introduction of uniform viscosity and controlled temperature application of finishes. Industrial finishes go further when applied hot. Frequently, one coat of heat-reduced high-solids film can replace two coats for a faster sag-proof application. Equipment for such application requires some sort of heat exchanger and usually continuous paint circulation for intermittent spraying. One heating system, *Fig.* 6, does not circulate the paint but does keep it warm right up to the gun.

Normal spraying is limited by variations of temperature, humidity, air pressure and operator skill. Substitution of heat for thinner reduces quantity of thinner used, leads to quick drying and a heavier coat without sag. Hot spray is a misnomer because the materials are heated only above the boiling point of the solvents. Since this is done in a closed pressure system, the solvents rapidly evaporate when the material is expressed from the nozzle. Rapid evaporation cools that portion of the finish which reaches the workpiece.

The solvents reduce the viscosity at the nozzle but do not get to the workpiece. Hot sprayed finishes are smooth and uniform because less pressure is needed to atomize the material. Less shrinkage of applied coats takes place with hot spray because there is little solvent to evaporate from the workpiece surface.

Some tests have shown that hot spray gives better adhesion, improved gloss retention and better impact resistance than cold sprays. Temperature of the spray area is minimized with this process. There can be a 30 percent viscosity change when ambient temperature changes from 60 to 75F but there is ony a 4 percent change from 150 to 156F.

Blushing or dulling of a coating is due to fast-evaporating solvents that cause moisture in the air to condense on the surface. Because the solvents evaporate in the air during hot spraying, this action does not take place. In general, any organic finishing material can be applied by hot spray when properly formulated. Overspray and fog are re-

duced to save money and improve conditions because lower air pressures can be used. Clear lacquers are heated to about 160F, synthetic enamels to about 130F. Where rubbing is required between coats, the time necessary for the operation is considerably reduced when hot spraying because the coats are more uniform.

Since paints are poor conductors of heat, good equipment design dictates that the heat transfer be by film. Otherwise, some of the paint may be overheated and may break down or discolor. Early heaters had coil type heat exchangers. Newer coilless heaters have small unit capacities, *Fig.* 7, but, because they transfer heat quickly, they have large capacities without the troubles frequently associated with the coil design. Such heaters tended to clog, restrict fluid passages and reduce heat transfer.

Heaters can be located in the line, at the gun or centrally. Heating media include steam, hot water, permanent heat-transfer liquids and electrically heated aluminum plates. Atomizing air can be at room temperature or heated.

Hot airless atomization depends on internal forces of expansion which are suddenly released. Hydraulic pressure, 300 to 600 psi, is applied to material that is heated at 160 to 200F. This pressure and the vapor pressure built up during heating cause atomization of the finish through nozzles of a type normally used to break up water solutions. Because air is not used, the part of the finish that reaches the workpiece is warm. The spray gun for this process is light because it is nothing more than a trigger with a nozzle.

**Flow Coating:** Modern flow coating systems are designed in such a way that almost all of the coating material used ends up on the work being finished. This is because adequate drain chambers are provided and the collected paint can be reused. Low-pressure flow coating, *Fig.* 8, can be done by hand or in a machine. A piece of tubing or pipe with little if any restriction is used as a nozzle. Paint strikes the object with little velocity and there is little splashing. This method requires a comparatively large flow.

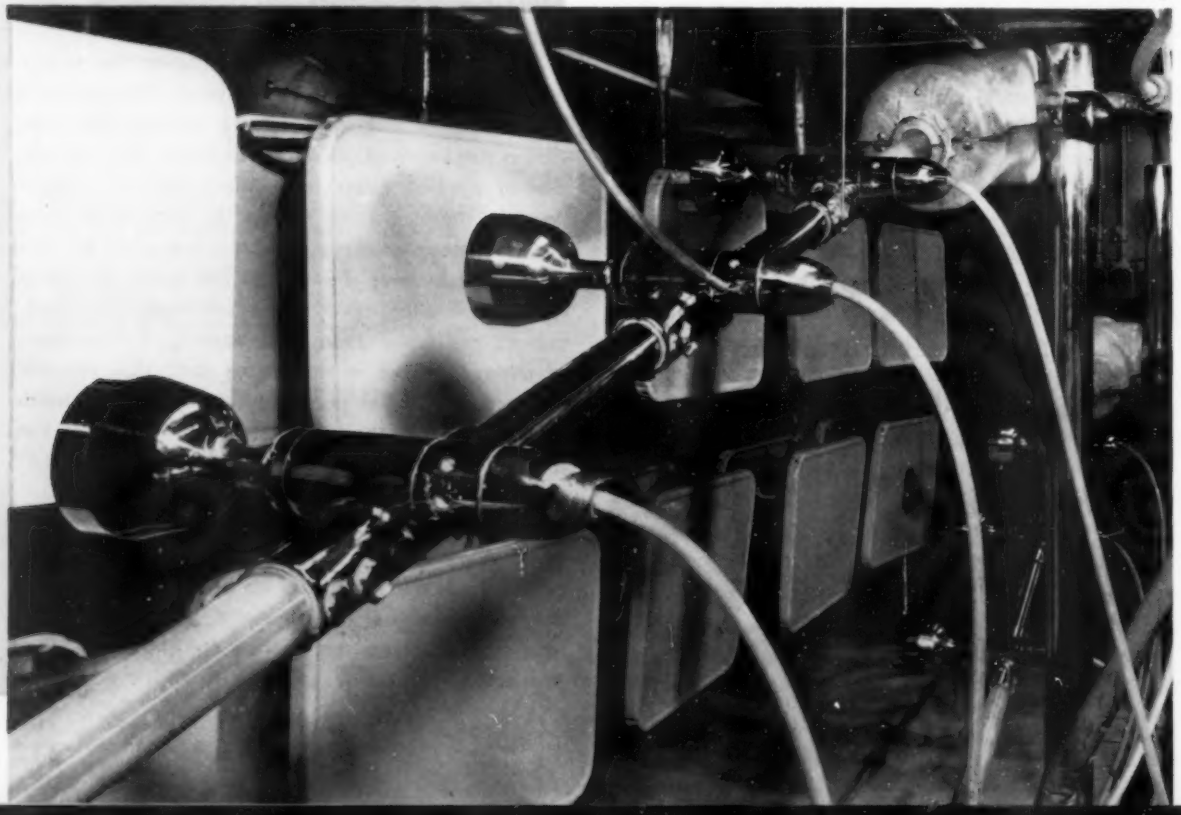
In high-pressure flow coating machines, a large number of stationary nozzles is used. Machines with moving nozzles require fewer nozzles and smaller equipment. A high degree of atomization is achieved mechanically with high-pressure systems. Flow coating can be used for low viscosity finishes such as zinc chromate.

Flow coating increases output, cuts labor and finishing costs, and reduces handling where small multisurfaced parts are concerned. Small parts are loaded on mesh or screen trays and run through the machine. Parts up to 5 by 6 feet can also be handled efficiently.

Important variables of the process are nozzle pressure, ratio of thinner to finish and nozzle vol-

**Fig. 9. Two batteries, of three electrostatic units each, effectively finish metal household furniture. Nozzles whirl at high speed.**

*—Photo courtesy Ransburg Electro-Coating Corp.*



ume. These influence thickness of finish and amount of thinner lost. Pressure is exceedingly critical. If the pressure is raised 1 to 2 psi, up to three times as much thinner can be lost. Less material is required for flow coating than for dipping, but more thinner is required. Solvent vapors used in flow coating are heavier than air so that chambers are frequently lower than their openings to reduce vapor losses.

**Electrostatics:** The basic process is one of atomizing paint into particles by the action of an electrostatic field and, with the same field, causing all the particles to go to the article being finished. Articles to be coated are grounded through the conveyor and, depending on their shape, may be rotated. This is a good process to consider when conveyorization is worthwhile. Uniform results are achieved with a minimum of finish material. Water-wash booths are not required and the only ventilation needed is to remove solvents. Building heat losses are not high through the exhaust system.

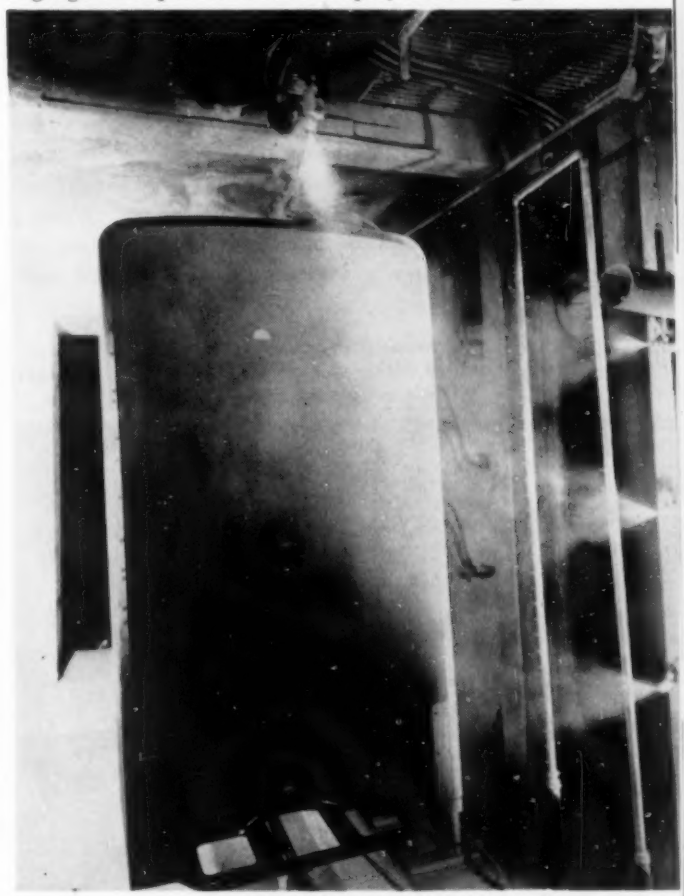
Variables common to air spray methods, atomizing air pressure, fluid delivery rate, spray pattern size and shape, and exhaust air currents, are not problems in electrostatic finishing. There is a growing use of heater units with the various electrostatic systems. This has resulted because such systems require much greater reduction of paints than would be necessary for conventional cold spray methods.

With changes made in both materials and electrostatic equipment, this process is beginning to find success in the application of porcelain enamels, with the same advantages that appear with the spraying of regular organic coatings.

In one type of equipment, a voltage pack is connected to the paint sprayer, creating the field between it and the moving parts. A pump supplies paint through the hollow shaft of the atomizer. Rotation of the atomizer feeds the paint at a uniform rate to its outer edge. The paint is charged and atomized. Atomizers come in sharp, *Fig.* 9, or flat cones. They are also available as disks. The disk is normally used horizontal, although it can be at a slight angle, inside a loop in the finishing conveyor. Products to be painted usually rotate as they go around the loop. The disk reciprocates up and down so that complete coverage is achieved. Stroke length can be changed while the unit is operating so that as different parts come on the line they can be completely finished without loss of paint.

Another system uses a standard spray gun with air atomization. These guns have the advantage of controlled operation because they can be started and stopped as parts pass by on the conveyor.

**Fig. 10. Ashdee spray system uses standard spray guns operating between negative electrodes. The single gun at top is for fill and its spray is not charged.**



*—Photo courtesy Coolerator Co.*

A flat spray pattern gives the most uniform coating. As paint leaves the spray gun, it passes between two negative electrodes, *Fig.* 10, and enters the strong electrical field set up by them. Paint spray picks up a negative charge and is attracted to the grounded workpiece. This system operates at low fluid and air pressures.

Still another system is designed so that the distance from the spray gun to the work is reduced because the high-voltage grid is a part of the spray gun. This system also makes use of low pressure air for atomization.

With electrostatic detearing, articles supported from a conveyor are dipped or flow coated in the usual manner and then allowed to drain. When draining is about finished, the articles are carried over or adjacent to a grid that has a high electrical potential. The electrical attraction resulting from the potential difference removes the excess paint remaining at the drain points.

Workpieces should not go closer to the grid than about 8 inches. If they go too close, the unit will be de-energized because of the tendency to create a static spark. The size of the article has no ap-

preciable effect on the detearing action and detearing force is not effective on parts other than the drain points.

**Ovens and Drying:** Success or failure of a baked finish usually depends on close control of time and temperature. If the temperature is raised to shorten a bake, some resins will be overcured and removed from the formula. The final finish will not have the anticipated properties. When a baking temperature and time are given in the instructions for a formulation, they usually refer to the time required for the bake with the workpiece at the specified temperature, not the oven. With large, heavy walled objects, the time needed to bring the object to temperature may be rather long.

**Fig. 11. Finished products are conveyed between two panels of infrared heat sources to bake the coating for a time regulated by the conveyor speed.**

*—Photo courtesy Westinghouse Electric Corp.*

Heat alone is not sufficient to produce a good baked finish. There must be a definite minimum of clean fresh air circulated through the oven. Fresh air insures that oxidation will be complete and that solvents will be removed. This leads to a smooth, hard, high-gloss finish. Wrinkle finishes are somewhat different. With these, the oven is purposely contaminated to heighten the wrinkle.

Ovens can be any size and designed for continuous or batch treating. Heat sources are usually steam, oil, gas or electricity. Indirect application is usually preferred with gas and oil to keep products of combustion away from the finished surface. Circulation of air in the oven can depend on the type of and method of loading. This should be carefully considered and temperatures should be checked at various points to insure uniformity.

Infrared heating, *Fig.* 11, has many advantages. It is clean, instantly available without warm up, can be shut down quickly, and can be altered easily by adding or removing bulbs. Visible light and heating rays have the same pattern so it is an easy matter to check that each part being dried is properly exposed. No shadows should exist on the part. An enclosure is a good idea because it will keep heat losses to a minimum. In a totally enclosed oven, circulating fans should be used to prevent temperature layers from forming and to remove solvents. When baking by infrared, it should be remembered that dark colors will bake out quicker than light ones because the darker colors can absorb more heat.

A new cold method of drying organic finishes uses a chemical instead of oxidation. The process is based on the reaction of a chemical vapor, sulfur dichloride, on the resins and oils in a coating. Hardening is achieved by a cross-linking of the resins and oils which is different than that produced in the usual oxidation or polymerization. A short time in this vapor produces an initial set to the coating. The hardening can then be completed outside of the vapor. Articles can be given an initial set, then packed and allowed to finish dry in transit.

It is hoped that this series of articles has stirred the imagination and caused some introspection into current finishing methods. No article can give all the answers because in most instances the combination of desired product properties and application methods are individualistic. Also, new materials and new methods are being announced every day. Every industrial organization should have one man, part of whose duties it should be to keep informed on finishes for metals.

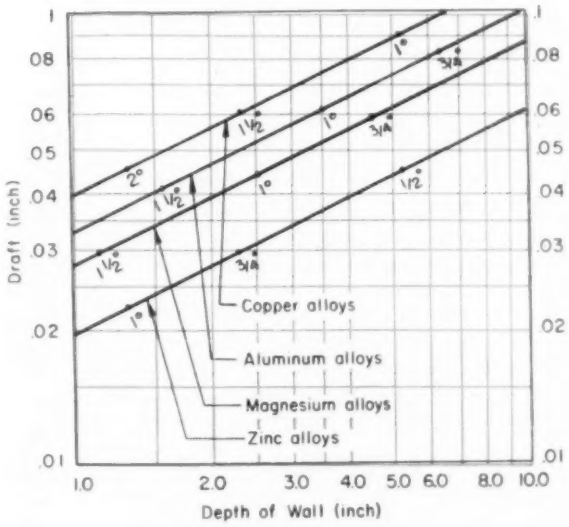
**Acknowledgments**

The helpful cooperation of the following companies in supplying information for this article is gratefully acknowledged:

Ashdee Products, Inc. ..... Homewood, Ill.
Atlas Powder Co. ..... Stamford, Conn.
E. F. Houghton & Co. ..... Philadelphia, Pa.
National Paint, Varnish and Lacquer Assn. ..... Washington, D. C.
Ransburg Electro-Coating Corp. .... Indianapolis, Ind.
Reynolds Metals Co. ..... Louisville, Ky.
Scientific Electric ..... Garfield, N. J.
The Sherwin-Williams Co. ..... Cleveland, Ohio
Spee-Flo Corp. ..... Houston, Tex.
Superkleen Brushes ..... Princeton, Ind.

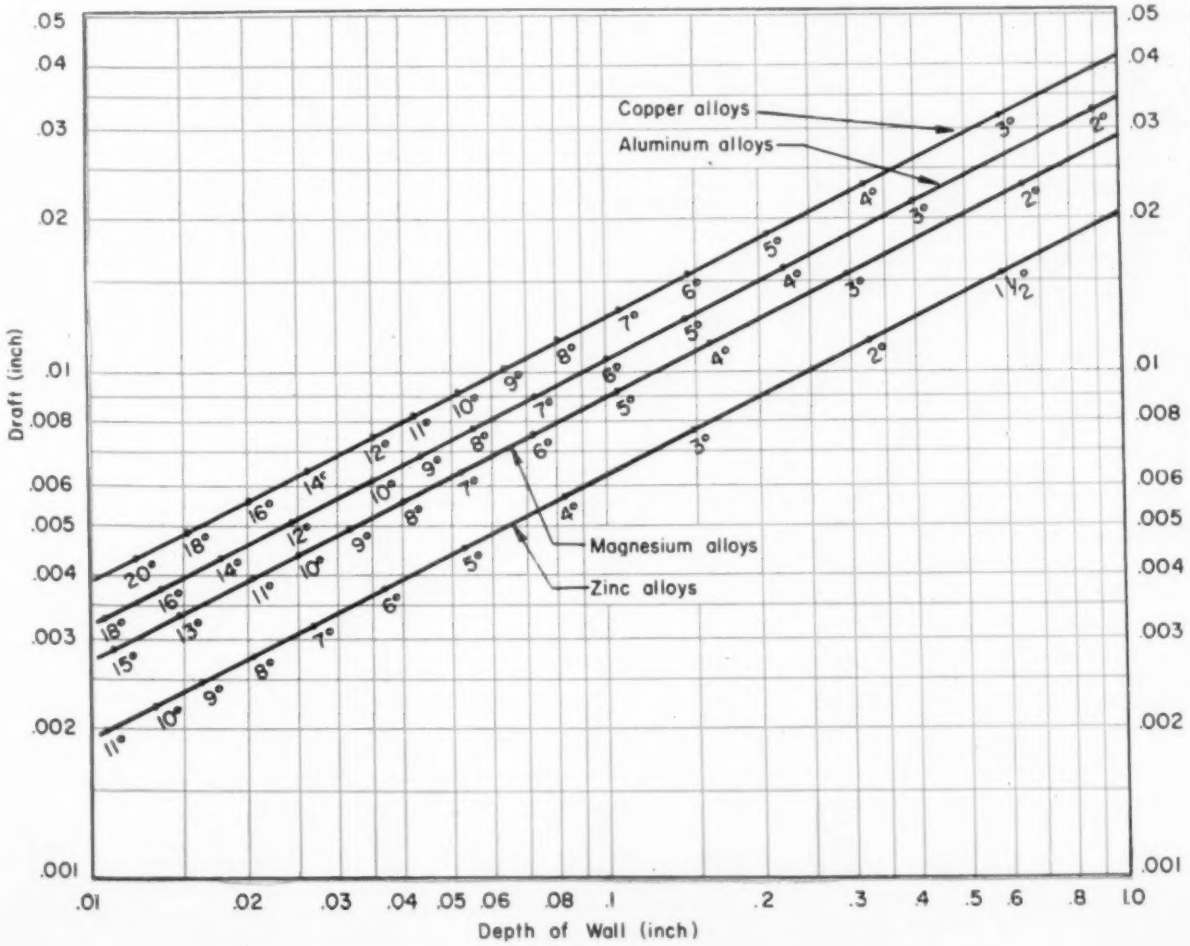
# Draft Requirements For Die Casting Walls






ALL WALLS ON DIE CASTINGS normally vertical to the parting plane of the die casting die require draft or taper. Since the draft varies with the alloy used and the depth of the wall, the American Die Casting Institute, Inc., has formulated tentative standards as indicated by the graphs reproduced on this page. The large graph is used for walls less than one inch in depth. Graphs have been prepared to indicate draft on inside walls. Outside wall draft is one-half of that required for inside walls of the same depth. These draft requirements do not apply to lettering, engraving or honeycomb designs in die castings.

Values shown by these graphs represent normal production practice at the most economic level. Deviations from these values may increase production difficulties and costs.



# Feeds for Knurling

As a general rule, a knurl can be worked at the same speed as circular form or other tools in a setup. Feeds in this table are approximate and based on the use of high-speed steel knurls, an eight-hour tool life and average parts. These figures must be altered to meet conditions of part design, finish required, material, cutting fluid and machine.

Feeds for backing off knurls should be: twice listed values for brass, aluminum and free-machining steel; three times listed values for alloy and tool steels. When two knurls are used at the same time for spiral or diamond knurling, feeds may be increased by 15 to 25 percent.

## Feeds for Cross Slide Knurling

| Material | Stock dia. (inch) | Width of Knurl (inch) 1/16 Feed (ipr) | 1/8 Feed (ipr) | 3/16 Feed (ipr) | 1/4 Feed (ipr) | 5/16 Feed (ipr) | 3/8 Feed (ipr) | 7/16 Feed (ipr) | 1/2 Feed (ipr) | 5/8 Feed (ipr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum or Brass | 1/4 | 0.004 | 0.0035 | 0.003 | 0.0025 | 0.002 | 0.0015 | 0.001 | 0.0005 | 0.0005 |
| | 3/8 | 0.0048 | 0.0043 | 0.0038 | 0.0033 | 0.0028 | 0.0023 | 0.0018 | 0.0013 | 0.001 |
| | 1/2 | 0.006 | 0.0055 | 0.005 | 0.0045 | 0.004 | 0.0035 | 0.003 | 0.0025 | 0.002 |
| | 3/4 | 0.0075 | 0.007 | 0.0065 | 0.006 | 0.0055 | 0.005 | 0.0045 | 0.004 | 0.0035 |
| | 1 | 0.009 | 0.0085 | 0.008 | 0.0075 | 0.007 | 0.0065 | 0.006 | 0.0055 | 0.005 |
| | 1 1/4 | 0.011 | 0.0105 | 0.010 | 0.0095 | 0.009 | 0.0085 | 0.008 | 0.0075 | 0.007 |
| Free Machining Steel | 1/4 | 0.003 | 0.0025 | 0.0022 | 0.002 | 0.0015 | 0.0012 | 0.001 | 0.0005 | 0.0005 |
| | 3/8 | 0.0038 | 0.0033 | 0.003 | 0.0028 | 0.0023 | 0.002 | 0.0018 | 0.0012 | 0.001 |
| | 1/2 | 0.005 | 0.0045 | 0.0042 | 0.0035 | 0.003 | 0.0025 | 0.002 | 0.0018 | 0.0015 |
| | 3/4 | 0.0065 | 0.006 | 0.0055 | 0.005 | 0.0045 | 0.004 | 0.0035 | 0.003 | 0.0025 |
| | 1 | 0.0075 | 0.007 | 0.0065 | 0.006 | 0.0055 | 0.005 | 0.0045 | 0.004 | 0.0035 |
| | 1 1/4 | 0.009 | 0.0085 | 0.008 | 0.0075 | 0.007 | 0.0065 | 0.006 | 0.005 | 0.004 |
| Alloy or Tool Steel | 1/4 | 0.002 | 0.0018 | 0.0015 | 0.0012 | 0.001 | 0.0008 | 0.0006 | 0.0004 | 0.0004 |
| | 3/8 | 0.0025 | 0.0023 | 0.002 | 0.0017 | 0.0015 | 0.0013 | 0.0011 | 0.0009 | 0.0007 |
| | 1/2 | 0.003 | 0.0028 | 0.0025 | 0.0022 | 0.002 | 0.0018 | 0.0016 | 0.0014 | 0.0012 |
| | 3/4 | 0.004 | 0.0038 | 0.0035 | 0.0032 | 0.003 | 0.0028 | 0.0026 | 0.0024 | 0.002 |
| | 1 | 0.005 | 0.0045 | 0.004 | 0.0035 | 0.0038 | 0.0035 | 0.003 | 0.0028 | 0.0025 |
| | 1 1/4 | 0.006 | 0.0055 | 0.005 | 0.0045 | 0.0043 | 0.004 | 0.0038 | 0.0035 | 0.003 |

## Feeds for Turret Knurling

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum or Brass | 1/4 | 0.015 | 0.014 | 0.0135 | 0.0125 | 0.012 | 0.011 | 0.010 | 0.0095 | 0.009 |
| | 3/8 | 0.017 | 0.016 | 0.0155 | 0.0145 | 0.014 | 0.013 | 0.011 | 0.0105 | 0.010 |
| | 1/2 | 0.021 | 0.020 | 0.0195 | 0.019 | 0.0185 | 0.0175 | 0.0165 | 0.016 | 0.015 |
| | 3/4 | 0.022 | 0.021 | 0.0205 | 0.0195 | 0.019 | 0.018 | 0.017 | 0.0165 | 0.016 |
| | 1 | 0.023 | 0.022 | 0.0215 | 0.0205 | 0.020 | 0.019 | 0.018 | 0.0175 | 0.017 |
| | 1 1/4 | 0.024 | 0.023 | 0.0225 | 0.0215 | 0.021 | 0.0205 | 0.020 | 0.0195 | 0.019 |
| Free Machining Steel | 1/4 | 0.012 | 0.0112 | 0.0105 | 0.010 | 0.0092 | 0.0085 | 0.008 | 0.0075 | 0.007 |
| | 3/8 | 0.015 | 0.0142 | 0.0135 | 0.013 | 0.0122 | 0.0115 | 0.011 | 0.0105 | 0.010 |
| | 1/2 | 0.019 | 0.0182 | 0.0175 | 0.017 | 0.0162 | 0.0155 | 0.015 | 0.0145 | 0.014 |
| | 3/4 | 0.020 | 0.0195 | 0.019 | 0.0185 | 0.018 | 0.0175 | 0.017 | 0.0165 | 0.016 |
| | 1 | 0.0205 | 0.020 | 0.0195 | 0.019 | 0.0185 | 0.018 | 0.0175 | 0.017 | 0.0165 |
| | 1 1/4 | 0.021 | 0.0205 | 0.020 | 0.0195 | 0.019 | 0.0185 | 0.018 | 0.0175 | 0.017 |
| Alloy or Tool Steel | 1/4 | 0.003 | 0.0028 | 0.0022 | 0.002 | 0.0018 | 0.0015 | 0.0012 | 0.001 | 0.0008 |
| | 3/8 | 0.004 | 0.0038 | 0.0032 | 0.003 | 0.0028 | 0.0025 | 0.0022 | 0.002 | 0.0015 |
| | 1/2 | 0.0055 | 0.0052 | 0.005 | 0.0045 | 0.004 | 0.0038 | 0.0032 | 0.003 | 0.0025 |
| | 3/4 | 0.006 | 0.0058 | 0.0052 | 0.005 | 0.0045 | 0.0042 | 0.004 | 0.0038 | 0.003 |
| | 1 | 0.0065 | 0.0062 | 0.006 | 0.0058 | 0.0052 | 0.005 | 0.0048 | 0.0042 | 0.004 |
| | 1 1/4 | 0.007 | 0.0068 | 0.0062 | 0.006 | 0.0058 | 0.0052 | 0.005 | 0.0048 | 0.0045 |

*Data courtesy* **The Cleveland Automatic Machine Co., Cincinnati, Ohio**

# News

AUGUST 1955

# featured this month


National Officers and Committee Chairmen Meet ..... 125
ASTE Charters 128th Chapter ..... 127
Die Design Handbook Rolling Off Presses ..... 127
New Student Chapters ..... 128
Conference at Michigan State ..... 129
National Committee Appointments ..... 130
Connecticut Day ..... 131
Fond du Lac Student Guidance Program ..... 132
Host Committee for 1956 Convention ..... 133
Past President Smila Dies ..... 133
Positions Wanted and Available ..... 137
ASA Names Society as Committee Sponsor ..... 138
Life Membership Requirements Outlined ..... 139


# chapter news


Albuquerque ..... 136
Battle Creek ..... 137
Binghamton ..... 137
Calumet Area ..... 138
Canton ..... 134
Central Pennsylvania ..... 138
Chautauqua-Warren ..... 139
Cincinnati ..... 134
Dayton ..... 136
Detroit ..... 137
Erie ..... 133
Fairfield County ..... 131
Fond du Lac ..... 132
Fort Wayne ..... 135
Golden Gate ..... 135
Greater Lancaster ..... 135
Hamilton District ..... 138
Hartford ..... 131
Kalamazoo ..... 135
Kansas City ..... 134
La Crosse ..... 138
Lehigh Valley ..... 134
Lima ..... 132
Little Rock ..... 136
London-St. Thomas ..... 135
Long Beach ..... 134
Los Alamos ..... 134
Los Angeles ..... 139
Memphis ..... 137
Mohawk Valley ..... 135
Montreal ..... 139
Nebraska ..... 135
New Haven ..... 131
Peoria ..... 135
Philadelphia ..... 136
Piedmont ..... 134
Purdue University ..... 135
Rochester ..... 138
San Fernando Valley ..... 139
San Gabriel Valley ..... 138
Santa Ana Valley ..... 136
Springfield, Mass. ..... 134
Springfield, Ohio ..... 136
Tucson ..... 137
Utah State ..... 136
Wayne University ..... 131
Western Reserve ..... 139

**Greetings from the headquarters staff are given to visiting officers and chairmen. From left: Allan Ray Putnam, assistant executive secretary; Harry E. Conrad, executive secretary; Dr. Harry B. Osborn, Jr., president; Fred J. Kampmeier, finance chairman, John X. Ryneska, secretary; the late W. H. Smila who was judicial chairman; and H. Dale Long, treasurer.**

# National Officers and Committee Chairmen Outline ASTE Activities for 1955-56

Integration of ASTE committee activities was the subject of a meeting of all national officers and committee chairmen held June 11 at Society headquarters in Detroit.

Goals for the year and special programs were covered at a general session conducted by Dr. Harry B. Osborn, Jr., ASTE president.

Afterwards vice presidents Howard C. McMillen, Harold E. Collins, R.C.W. Peterson and Wayne Ewing met with the chairmen of the various committees assigned to them to discuss specific plans. Staff administrators and other headquarters personnel also participated in these discussions.

**Matters pertaining to the ASTE constitution and by-laws are covered by Vice President Wayne Ewing, left, Constitution Chairman Vincent M. Spahr, center, and Staff Administrator Marvin J. Bunting.**

Returning from the luncheon break, from left, are: Editorial Chairman Joseph L. Petz, *The Tool Engineer* Editor John W. Greve, Book Chairman Francis J. Sehn, Vice President Collins, Technical Director Frank W. Wilson, Standards Chairman William Moreland, and Staff Administrator George Hargreaves.

Vice President R. C. W. Peterson, left, discusses committee programs with Professional Engineering Chairman Leslie Seager, Education Chairman Robert E. McKee and Staff Administrators George Hargreaves and Richard Bacik.

Meeting with Vice President McMillen, far right, are: (from left) Staff Administrator Bunting, Public Relations Chairman Wilfred B. Wells, Membership Chairman H. Verne Loeppert, Staff Administrator Bacik, Program Chairman Philip R. Marsilius, and Research Director Leslie S. Fletcher.

# ASTE Charters 128th Chapter

**Officers and guests at the Northwestern Pennsylvania chartering included, from left: Herbert Dickinson, Gordon Carlson, Amos Zwald, Marvin Bunting, Kenneth Stoll, National Director Horne, George Hunt, John McClure, John August, Donald Howard and William Larson.**

Serving tool engineers in Emporium, St. Marys, Port Allegheny and Austin, the Northwestern Pennsylvania chapter was officially added to the ASTE roster on May 26. Chartering ceremonies were conducted at the Moose Lodge in Emporium by James O. Horne, member of the Society Board of Directors.

He administered the oath of office to: Kenneth M. Stoll, chairman; John R. McClure, first vice chairman; Amos Zwald, second vice chairman; Herbert Dickinson, treasurer; and Don F. Howard, secretary.

The chairman's pin was presented by Gordon Carlson, chairman of Chautauqua-Warren chapter. Presentation of the banner and the membership kit was handled by John J. August, Erie chairman, and George E. Lunt, Williamsport chairman.

In his discussion at the dinner meeting, Mr. Horne congratulated members of the Northwestern Pennsylvania chapter for doing such a commendable job in organizing their group and gave an address on "Opportunities in Tool Engineering."

Another talk was made by Marvin Bunting, ASTE staff administrator, who discussed national headquarters services.

Members appointed to serve as committee chairmen for the chapter are: J. H. Clark, program; W. G. Hickoff, membership; W. H. Bingeman, public relations and national delegate; F. H. Grimone, editorial; E. O. Thorson, education; R. O. Bishop, standards; Charles Smith, professional engineering; and W. H. Larson, constitution.

---

# DIE DESIGN HANDBOOK rolling off the presses

Culminating four years of data search, planning, writing and reviewing, the ASTE *Die Design Handbook* is now a reality.

First copies to come out of the bindery at McGraw-Hill Book Co., Inc., New York will go out to meet the heavy backlog of advance orders, some received as long as two years ago.

The *Die Design Handbook* represents an untold amount of work on the part of its editors and members of the ASTE National Book Committee, headed by Francis J. Sehn, Detroit consulting engineer. Executive editor of the *Handbook* is Frank W. Wilson.

Vital statistics of the book are: 752 pages, 632 charts and illustrations, and 161 tables. ASTE members will be able to get their copies for $9.75, nearly $5 less than the retail list price of $14.50 for nonmembers.

In scope, the book is specialized to cover tool and operations in the cold pressworking of sheet or strip metal. Its purpose is to make available the essential design details of dies that have proved successful in scores of company pressworking operations.

As stated by ASTE President Harry B. Osborn, Jr., "For the tool engineer who is in any way involved in dies and pressworking—and what tool engineer today isn't—this *Handbook* is a must!"

# Franklin Technical Institute

**John X. Ryneska, ASTE national secretary and chartering officer, presents the officers of Franklin Technical Institute student chapter with their charter. From left, are: James B. Forsythe, Mr. Ryneska, Donald F. Gaines, Charles E. Burrill, Jr., Charles Rice, and Raymond M. Russell, Jr.**

Franklin Technical Institute in Boston became the first officially chartered student chapter in the New England area on June 7. In ceremonies which were a part of the school's graduation exercises, thirty engineering students received the eighth charter to be granted to a student chapter by the Society.

John X. Ryneska, national ASTE secretary and purchasing agent for General Electric Co., Lynn, Mass., presented the charter on behalf of the Society. He also spoke on tool engineer training.

Among special guests were: Richard A. Smith of Hartford, ASTE director and chief tool engineer for the Pratt & Whitney Div., Niles-Bement-Pond Co.; and Prof. Arthur F. Gould, member of the National Education Committee and head of industrial engineering at Lehigh University.

# City College of New York

Students at City College of New York received their official ASTE charter on May 23 at a dinner held in the New York Times Service Dining Room.

Officiating was John X. Ryneska, national ASTE secretary, who swore in the officers and charged them with their duties. Officers are: Herbert Geissler, chairman; Sheldon Chesis, first vice chairman; Irwin Mortman, secretary; and Bernard Lieberman, treasurer.

Presentations included those of the charter by William Reber, chairman of the Greater New York chapter, and the membership kit by Carl Kertesz of the National Membership Committee.

Guest speaker was Merrell Flood, professor of industrial engineering at Columbia University.

Many members of the Greater New York ASTE chapter were on hand to extend a hearty welcome to the new student chapter.

**Officers of the City College of New York student chapter proudly display the charter which makes them official members of the Society. Faculty advisor for the group is Prof. Henry Updegrove.**

Among those at the Michigan State conference were, from left: William Janetzke, chairman of the Lansing chapter; Howard C. McMillen, national vice president; Charles Bonczyk of Western Michigan chapter; H. Verne Loeppert, chairman of the National Membership Committee; Glenn L. Crippen, secretary of the Lansing chapter; and Marvin Bunting, staff administrator from National Headquarters in Detroit.

# conference at Michigan State

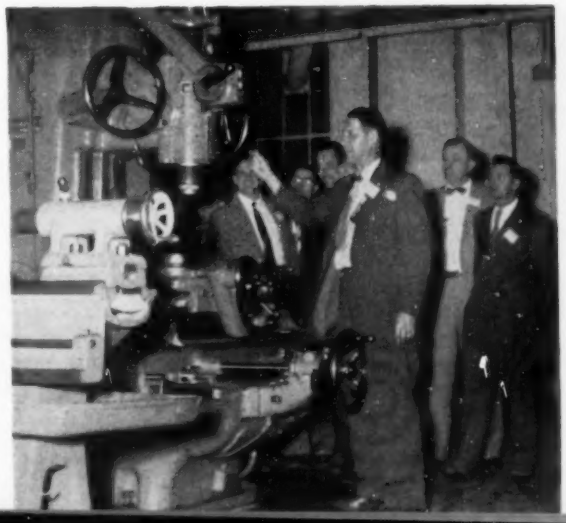
Michigan State University's second annual on-campus conference, held May 14, was sponsored by the central Michigan chapters of ASTE in cooperation with the MSU Department of Mechanical Engineering and ASTE's National Education Committee.

National ASTE officials who participated in the program included: Howard C. McMillen and Raymond C. W. Peterson, national vice presidents of ASTE; Charles M. Smillie, ASTE director; Carl Oxford, Jr., member of the National Education Committee; and H. Verne Loeppert, chairman of the National Membership Committee.

Vice President McMillen, manager of the Philco Corporation's Bedford plant, spoke on the conference theme, "The Tool Engineer of Tomorrow." "Properties and Machinability of Titanium" was discussed by Prof. O. W. Boston of the University of Michigan.

In the afternoon a panel discussion by three Ford Motor Co. engineers—W. E. Burnett, P. M. Clayton and C. F. Cramer—followed by a coffee hour wound up the day's activities in East Lansing.

Philip McKenna, president of Kennametal Corp., Latrobe, Pa., and recent recipient of one of ASTE's Gold Medal Awards, the Engineering Citation, was guest speaker at the luncheon.



Conferees had an opportunity to view the Michigan State machine shops and laboratories. Prof. O. G. McMurray guides one of the touring groups.

*Keeping pace with Society growth, many of ASTE's national committees have been expanded this year. In addition to enabling the committees to work more efficiently on their projects, more chapter members will have an opportunity to participate in national activities of the Society.*

# national committee appointments

Serving on ASTE's national committees for 1955-56 will be more than 100 men appointed by Society committee chairmen.

The ASTE **National Book Committee,** headed again by Francis J. Sehn, will include: George De Groat of Detroit; Willis J. Potthoff of St. Louis; Richard T. Thornton of Detroit; Philip C. Wood of Toledo; W. F. Ardussi of Cleveland; John S. Brozek of New Haven; Frank W. Curtis of Detroit; William H. Gourlie of Hartford; Prof. R. S. Green of Columbus; Richard D. Gross of Philadelphia; O. E. Koehler of Northern Massachusetts; R. C. Montanus of Springfield, Mass.; Waldemar Naujoks of Syracuse; Edward A. Reed of Saginaw Valley; Dr. G. A. Roberts of Pittsburgh; George H. Sanborn of Detroit; Dr. A. O. Schmidt of Milwaukee; Norman F. Snyder of Saginaw Valley; Earl K. Wheat of Mohawk Valley; and Frank T. Wruk of Racine. National Vice President Harold E. Collins is an ex-officio member of the Committee.

Rules, regulations and procedures will be the chief concern of the **National Constitution and By-Laws Committee,** headed this year by Vincent M. Spahr. Serving under him will be Arthur Cervenka of Long Island, vice chairman; Mel Burdett of Louis Joliet; Irving F. Holland of Hartford; and Roy O. White of Wichita. National Vice President Wayne Ewing meets with the Committee as an ex-officio member.

The **National Editorial Committee,** again under the chairmanship of Joseph L. Petz, will devote its efforts toward the best publication year for THE TOOL ENGINEER yet. The committee will consist of Gustave B. Berlien of Golden Gate, vice chairman; Lee M. Davis of Twin States; Harold Hagle of Erie; Ralph F. Mueller of St. Louis, Donald E. Wernz of Baltimore; and Donald E. Zierk of Fox River Valley. Vice President Collins is an ex-officio member of the committee.

Wider dissemination of the knowledge of tool engineering will be the goal of the **National Education Committee,** headed for the second year by Robert E. McKee. Committee members are Prof. Myron L. Begeman of Houston, vice chairman; Prof. Charles C. Lasater of Knoxville-Oakridge; Prof. Arthur Gould of Lehigh Valley; Prof. Orville D. Lascoe of Indianapolis; R. B. Niebusch of Cincinnati; C. J. Oxford, Jr., of Detroit; Prof. Frederick Preator of Salt Lake City; Frank Ritchie of Windsor; and Kenneth J. Trigger of Chicago. Raymond C. W. Peterson, national vice president of the Society, is an ex-officio member of the committee.

For the second year ASTE's money matters are in the hands of Fred Kampmeier who heads the **National Finance Committee.** Serving with Mr. Kampmeier are: Frank J. Hausfield, Jr., of Evansville, vice chairman; Deane Brighton of Peoria; H. Dale Long of Chicago; Robert J. Pioch of Jackson; and A. A. Reddy of Wichita. Ex-officio member of the Committee is National Vice President Howard C. McMillen.

The very distinguished **National Honor Awards Committee,** consisting entirely of ASTE's past president, will be led this year by Walter F. Wagner. Also on the committee will be Frank W. Curtis of Detroit, vice chairman; A. H. d'Arcambal of Hartford; Cletus V. Briner of Cleveland; Douglas D. Burnside of Nashville; Ray H. Norris of Hartford; Albert M. Sargent of Detroit; James R. Weaver of Springfield, Mass.; and Otto W. Winter of Buffalo-Niagara.

Another very distinguished group, the **National Judicial Committee,** like the Honor Awards Committee, is made up of past presidents of the Society. Serving this year are: A. H. d'Arcambal; T. Bert Carpenter of Detroit; Frank W. Curtis; Ray H. Morris; Frank A. Shuler; Walter F. Wagner; James R. Weaver; and Otto W. Winter.

ASTE's largest committee, the **National Membership Committee,** will be headed this year by H. Verne Loeppert. Area captains are: Irving H. Buck of North Texas; Ervin A. Byro of Muskegon; Lawrence H. Cook of Santa Clara Valley; Carl A. Darger of Muncie; Frank A. Flannery of Akron; Sam L. Grasso of Nebraska; Gordon Hall of Hamilton; Carl Kertesz of Chicago; Emanuel E. Lull of New Haven; Floyd J. McArthur of Twin States; Albert F. Moosbrugger of Piedmont; and William W. Schug of Mid-Hudson. Area lieutenants include: Alfred E. Beaumont of Los Angeles; George W. Christiansen of Racine; George H. Churchill of Hamilton; Clinton J. Helton of Denver; James C. Rodgers of Baltimore; Orville B. Strahm of Wichita; and Richard B. Sullivan of Toledo. Vice President McMillen sits with the committee in an ex-officio capacity.

Leslie C. Seager, newly appointed chairman of the **National Professional Engineering Committee,** will be aided by members: Verne H. Gallichotte of Golden Gate, vice chairman; Hugo L. Aglietti of Long Island; Thaddeus Czaki of Memphis; Prof. Larry E. Doyle of Chicago; Jimmie E. Franklin of North Texas; Howard W. Gross of Philadelphia; George Julien of Twin States; John Lengbridge of Toronto; Charles M. Smillie of Detroit; and Charles H. Thuman of Evansville. Vice President Peterson is an ex-officio member of the Committee.

The **National Program Committee's** new chairman is Philip R. Marsilius. He will carry out the activities of the Committee with the help of these additional committee members: Paul Brainard of Houston; James V. Coulter of Golden Gate; Edw. Neal Dietler of

Piedmont; Dave R. Few of Toronto; Edmond Hollingsworth of Philadelphia, vice chairman; James R. Matthew of Tucson; Karl G. Nowak of Boston; Harry A. Paine of Chicago; Gerald K. Sick of Rochester; and Edward D. Ward of Detroit. Vice President McMillen is an ex-officio member of the Committee.

The program of the **National Public Relations Committee**, under the new leadership of Wilfred B. Wells, will be carried out by David A. Schrom of Central Pennsylvania, vice chairman; George C. Bennett of Long Island; Clifford P. Farr of Toronto; William Schleicher of Chicago; John A. Sheridan of Schenectady; Glen H. Stimson of Northern Massachusetts; and Harry J. Todd of Salt Lake City. Vice President McMillen will sit with this Committee as an ex-officio member.

New chairman heading the **National Standards Committee**, William Moreland had appointed John E. Rotchford of Worcester, vice chairman; George F. Bryan of Pontiac; Arthur E. Crom of San Diego; Clyde L. Fanning of Saginaw Valley; Louis Jensen of London-St. Thomas; Arthur M. Johnson of Potomac; Werner O. Miller of Lehigh Valley; Harry J. Moffatt of Louis Joliet; Joe Penn of Indianapolis; Ralph I. Robbins of Merrimack Valley; Dean Saurenman of Houston; and Denis L. Swan of Windsor. Ex-officio member of the Committee is Vice President Collins.

A very active standing committee is the **Research Fund**, established to work for an increase in research in the broad tool engineering field.

Industrialists who give their time to the Research Fund include: Robert B. Douglas, past president of ASTE and president of Specialloid Ltd., of St. Eustache, Que., Canada, who is chairman; Wallace E. Carroll, president, Simpson Electric Co. of Chicago; Dwillard J. Davis, vice president of manufacturing, Ford Motor Co. of Dearborn; Dr. William E. Mahin, affiliated with Hunter Engineering, Riverside, California; Daniel J. Martin, vice president of engineering, Hughes Tool Co. of Houston; Louis Polk, president, The Sheffield Corp. of Dayton; Joseph Sunnen, president, Sunnen Products Co. of St. Louis; and George W. Trichel, executive vice president, Amplex Division, Chrysler Corp. of Detroit. Harry E. Conrad, ASTE executive secretary, and Col. Leslie S. Fletcher, ASTE research director, provide staff service for the Committee.

As THE TOOL ENGINEER goes to press, Ralph L. Chrissie of Los Angeles has been named to the National Program Committee, and R. L. Vanderslice of Lansing has been made a member of the National Book Committee.

**Principal participants in the seventh annual Connecticut Day program, from left, included: Joe Balcinnas, Hartford chairman; Richard Smith, national director; John S. Brozek, chairman of the program; Howard C. McMillen, ASTE vice president; Harry E. Conrad, ASTE executive secretary; E. R. Mayberry, Fairfield County chairman; and Charlton Gilbert, New Haven chairman.**

# Connecticut Day Program Draws Attendance of 462 Members and Guests

One of the major highlights of the year for New Haven, Fairfield County and Hartford members, the seventh annual Connecticut Tool Engineers' Day program was held May 11, with New Haven acting as host chapter. Attendance at the event totaled 462 members and guests, including visitors from chapters in New York, Rhode Island and Massachusetts.

Chairman of the program was John S. Brozek. He was assisted by Vice Chairmen Eugene Laistener of Fairfield County and Robert Gay of Hartford.

Activities opened in the morning at Yale University where the museum and laboratories were toured. The afternoon agenda offered plant visits at Greist Mfg. Co., Sargent & Co., Pratt & Whitney Aircraft Co., Safety Car Heating & Lighting Co., and Olin Mathieson Industries, which were followed by a technical session at Restland Farms.

Speaker at that meeting was James T. Kemp of American Brass Co. He spoke on "The Brasses, Copper and Some of the Other Alloys." Al Pollard acted as technical chairman.

Fitting climax for the program was the banquet, also held at Restland Farms. Toastmaster was Herman R. Giese, vice president and works manager of Sargent & Co.

Principal speaker was Albert S. Redway, general manager of research and development for the Paper Container Div., Continental Can Co., and president of the Manufacturers Association of Connecticut. He presented an address entitled "Connecticut—Its Industrial Importance."

Among the many guests introduced to the banquet audience was Al Pollard, the originator of the first Connecticut Day program, which was held at Waterbury.

WAYNE UNIVERSITY—Karl Anderson, right, chapter chairman, receives an ASTE International Education Award of $700 to be applied toward a year of graduate study. Making the presentation is Wesley Churchill, assistant professor of engineering. *—Wayne University Photo*

Presiding at the head table for Fond du Lac's student guidance dinner were: Henry Faith, chairman; Prof. Orville D. Lascoe of Purdue University, main speaker; and Russell Johnson, toastmaster.

# Fond du Lac Chapter Stages Fifth Annual Student Guidance Program

Continuing its unique student guidance program for potential engineers, Fond du Lac chapter was host to 93 high school seniors and their instructors on May 11. The event marked the fifth year that the chapter has devoted a day to the encouragement and counseling of high school seniors interested in engineering. Activities included plant tours, conferences on the opportunities of an engineering career, and were climaxed by a dinner.

Students were from 23 high schools in fourteen surrounding towns. Co-chairmen of the program were H. J. Van Valkenberg, industrial training coordinator at Fond du Lac Vocational School; and Neuman G. Reque of Oshkosh.

Members of the student guidance committee met and brought students and their instructors to the Kimlark Plant of Kimberly-Clark Corp. in Neenah, Wis., where they were welcomed by Ralph Buchen, engineering personnel manager for the company. The group toured the main engineering department and were then whisked to Kimberly, Wis., to see operations of the company's Lake View Mill.

Here, after being welcomed and briefed on mill processes by T. H. Perry, mill manager, and Frank Wilton, company training coordinator, the students divided off into groups of five for a guided tour of paper manufacturing operations.

The entire group then convened for an "off-the-cuff" discussion where a panel of Kimberly-Clark executives answered questions concerning the corporation and how engineering is applied and required in the plants.

The students were then brought to Appleton, Wis., for a dinner served at the Masonic Temple by the Eastern Star. Toastmaster for the evening was Russell Johnson, assistant chief engineer of Kimberly-Clark. He spoke briefly on the opportunities afforded a graduate engineer today.

The role of main speaker was handled ably by Orville D. Lascoe, professor of manufacturing processes at Purdue University. Prof. Lascoe, who has been associated with Purdue for 13 years and is a member of the ASTE National Education Committee, addressed the group on "A Future in Tool Engineering." He emphasized that besides engineering education, tool engineers must have broad vision, creative ability and originality of thought.

Fond du Lac Chairman H. S. Faith thanked Kimberly-Clark for their hospitality, the sponsoring companies and everyone who had helped to make the day an outstanding success.

## Lima Dance Proceeds Go to Scholarship Fund

Carl D. Steuber, a sophomore at Massachusetts Institute of Technology, was awarded a $250 scholarship by the Lima chapter from the proceeds of the May 13 spring dance.

Another May meeting was highlighted by a panel discussion on welding and welding symbols, emphasizing the importance of designating the proper type weld to be applied to any tool or fixture drawing for the purpose of conveying standard information to any department.

The three-man panel consisted of Vince Woodward of Baldwin-Lima-Hamilton who is also chairman of the American Society of Welding Engineers chapter; Gene Donathan of Superior Coach Corp., welding engineer; and Russell Tarlton of Westinghouse Electric Mfg. Corp., welding engineer.

*—Gene Stemen*

LIMA—E. W. Dickett, left, of Sundstrand Machine Tool Co., was guest technical speaker at a recent Lima chapter meeting. From left are: Robert Mercer, program chairman; and Robert Hughes, also of Sundstrand.

### *Fond du Lac Surveys Students*

Not satisfied with merely holding guidance days once a year, Fond du Lac chapter decided to find out what happened career-wise to students who had participated in the programs. Making a survey of those who had attended in 1952-53-54, they sent a questionnaire to each of the 263 students, getting 185 replies. Broken down on a percentage basis, results are as follows:

51.8% now in engineering schools

8.7% now in related fields, skilled mechanical trades, draftsmen, apprentices, etc.

11.8% now in related college courses

The chapter feels that the results are gratifying and in spite of the program's complexity and increasing costs, is determined to continue and broaden it.

## Host Committee Headed by H. Verne Loeppert

Although next March seems a long way off, especially during the torrid weather being experienced this summer in most parts of the country, plans are already well under way for ASTE's 1956 Industrial Exposition and Annual Meeting. The event will be held March 19 through 23 in Chicago, with activities centered at the International Amphitheatre and the Conrad Hilton and Palmer House hotels.

Host Committee plans and arrangements are handled by the Chicago chapter of ASTE. H. Verne Loeppert, who is also chairman of the Society's National Membership Committee, is general chairman of the Host Chapter Committee. Vice chairman is Harry A. Paine and secretary is Edward Schnell, Jr.

Division coordinators are Clark Shafer, Gordon Benes and Ben Fleury. Chairman of the banquet, ticket and transportation committees are Richard Miller, Edward Dickett and Fred Helms.

Plans for plant tours and registration are being made by committee chairmen C. Fred Duff and Joseph Barnett. Robert Ferguson is in charge of session arrangements; Harry Egan is head of the emergency committee; and Walter Haskins is in charge of the reception committee.

Publicity activities of the Host Committee are being handled by a committee headed by Ben Brosheer. The budget is the responsibility of committee chairman John H. Beck. Records and reports are charged to Clarence Brauer, and entertainment for convention week is being arranged by Jess McComb.

First joint meeting of the Host Committee and the ASTE National Program Committee, headed by Philip R. Marsilius, was held June 3 in Chicago. Individual efforts on the part of members of both groups are continuing throughout the summer months, with progress reports due in October.

## Past President Wallace H. Smila Dies

W. H. Smila

A founder of ASTE and at the time of his death the oldest living past president of the Society, Wallace H. "Bill" Smila died at his home in Detroit on July 3. He was 63.

Mr. Smila, who retired last year from his position as master mechanic at Plymouth Div., Chrysler Corp., was a Life Member and held many national offices during his long association with ASTE.

When the Society was established in 1932, he was elected to serve as first vice president and member of the Board of Directors, and was also appointed chairman of the National Membership Committee. The following year he was named national president and chairman of the Board. He completed five consecutive terms as a national director in 1937.

As chairman of the National Standards Committee from 1934-39, Mr. Smila helped inaugurate ASTE's data sheet service. He was reappointed committee chairman in 1945 and held the post until 1948.

In 1950 he became chairman of the Judicial and Honor Awards Committee. He would have completed his sixth term as head of judicial activities at the end of this year.

A registered professional engineer in Michigan, he was affiliated with the Detroit chapter of ASTE which he served as treasurer. He also held membership in the Michigan Society of Professional Engineers, the Engineering Society of Detroit and the American Ordnance Association.

## Appointed Sales Manager

Walter S. Baker, a member of the Hartford ASTE chapter, has been appointed district sales manager of the Universal-Cyclops Steel Corp.

## J. C. Molinar Named General Sales Manager

John C. Molinar has been appointed general sales manager of the Union Twist Drill Co. of Athol, Mass., according to an announcement by George F. Holland, president. Mr. Molinar, a member of the Cleveland ASTE chapter, was formerly vice president, general sales manager and director of Niles-Bement-Pond Co.

## New Post for Shepard

L. K. Shepard has been appointed sales manager of Machine Tool Division of The Hartford Special Machinery Co., Hartford, Conn., according to an announcement by Robert A. Bode, general sales manager. Mr. Shepard, a member of the Pittsburgh ASTE chapter, was formerly sales manager for the Drill Unit Division of the Rockwell Mfg. Co., Pittsburgh, Pa.

**ERIE—Chairman John August, center, presented awards to four outstanding students from two area colleges at the chapter's May 3 meeting. Each student was accompanied by a school sponsor. From left are: Charles Hughes of Pennsylvania State University's Behrend Center extension and his students James Culbertson and John Jamison; Chairman August; Students John Parrasewich and Clair Sweitzer with Dean E. J. Kruszka of Alliance Technical Institute. Messrs. Culbertson and Parrasewich received *Tool Engineers Handbooks* and Messrs. Jamison and Sweitzer were awarded student memberships.—*D. J. Beecher***

## Punch Press Tooling Covered at Piedmont

Featured speaker at the June meeting of Piedmont chapter was Robert P. Schneider, director of tool engineering at Western Electric Co., Burlington, N. C. He presented a program on "Punch Press Tools—High Production Versus Low Production."

On April 18 the chapter heard a talk on "Effects of Tooling on Industry," given by H. E. Linsley, associate editor of *American Machinist* magazine. He traced the advent of machine tooling and its effects on American life through the advent of rifles over muskets to present times. He was introduced by Past Chairman Sid Jeffreys.

The following evening, on April 19, Mr. Linsley and several Piedmont chapter officers journeyed to Raleigh, N. C., to put on a program for the Raleigh-Durham affiliate chapter. The meeting took place at the Westinghouse plant, with close to 100 members attending.

After the meeting, Chairman Al Fairchild appointed Al Hails, Bill Denton, Jim Norungolo, and Jesse Jones to serve on the nominating committee. Clyde Shannon was named as advisor to the group. *—A. R. Fairchild*

## Long Beach Families Tour Santa Fe Railyard

Long Beach members, guests and their families, numbering 366, boarded a special eight-car train at Riviera, Calif., and rode 60 scenic miles to the San Bernardino railyards of the Santa Fe Railroad. Upon arrival they were taken on a guided tour of the roundhouse and overhaul shops.

*—Jack B. Irby*

**LEHIGH VALLEY—Ralph Mueller, chairman presents the past chairman's pin to Werner O. Miller at Lehigh Valley's annual ladies' night. Mr. Miller has recently been appointed to the National Standards Committee.**

## Engineering Editor Speaks at Cincinnati

When the Cincinnati chapter held its seventeenth annual dinner meeting at the Hotel Alms, 457 were present to hear the guest speaker, George F. Nordenholt, editor of *Product Engineering*, a McGraw-Hill publication.

Mr. Nordenholt chose as his topic "Engineering for Might and Mercy," in which he pointed out that a nation's standard of living and economic position in the world is achieved by the capacity and teamwork of her engineers and scientists.

Coffee speaker was The Honorable James Garfield Stewart, Supreme Court Justice from the State of Ohio.

Chairman John Elfring also presented the past chairman's pin to retiring Chairman Joseph Maezer.

*—Barton Jones*

**SPRINGFIELD, MASS.—This group of ASTE members was among the 60 who traveled from Springfield to Cambridge, Mass., to attend the on-campus conference at Massachusetts Institute of Technology.—*Allen M. Johnson***

## Lehigh Valley Holds Annual Ladies' Night

The Jade Room of the Hotel Traylo was the scene of Lehigh Valley chap ter's June 17 annual ladies' night pro gram. The evening started with a re ception at which the ladies received corsages and progressed to roast beef and lobster tail dinner, group singing barbershop quartette entertainment and dancing. Music was provided by Leo Brailer's Trio.

*—Chauncey R. Kay*

## Canton Members Tour New Plant

Members and guests of the Canton chapter, numbering 130, toured the new plant of Warner & Swasey Co. in New Philadelphia, Ohio, on May 26. The tour comprised the fabricating and assembly plant of Gradall Div., as well as the small-parts factory.

Interesting demonstrations included the Gradall earthmover and the Warner & Swasey-Sulzer weaving machine. After the tour the group convened at the Reeves Hotel for a buffet supper, followed by a brief history and talk on the Warner & Swasey Co.

*—Clifford C. Smith, Jr.*

## Statistician Speaks at Kansas City Meeting

Robert Cell, chief statistician for Bendix Aviation Corp., was the guest technical speaker at Kansas City chapter's June 1 meeting. Speaking on statistical quality control, Mr. Cell explained the use of the sampling method of inspection as compared with 100 percent inspection and presented a demonstration of the use of control charts for acceptance or rejection of production lots.

Special guests were Prof. Arthur Paul, Prof. Ralph Tate and Instructor Joe Dickson of the University of Kansas. *—Gene E. Brunson*

## Los Alamos Hears About Patent Procedures

Patent procedures were discussed by Ralph Carlisle Smith at the June 15 meeting of the Los Alamos chapter. Chief patent attorney for Atomic Energy Commission operations at Los Alamos, he gave a brief history of early patent procedures right through present day practices, explaining the difference between copyrights, trademarks and patents. *—Lewis C. Osborn*

## Ladies' Night Program Held at Peoria

Annual ladies' night festivities took place on May 3 at Peoria's Hotel Marquette, with nearly 170 persons in attendance. A continental buffet dinner launched the evening program. Dinner music was offered by organist Carey Robards.

Guest speaker was Dr. Robert Bodine, pastor of the First Methodist Church. In his talk on "A Greater Generation" Dr. Bodine told how the greater generation would be developed through the union of efforts of the technical engineer and the human engineer. Toastmaster was Wes Leveck.

New chapter members include: James Couch, Benjamin Moore, Ralph Fairburn, Donald Manns, Dennis Tunis, Arthur Baurer, and William Heger.

*—W. C. Leveck*

## Surface Finish Control Discussed at Fort Wayne

Fred W. Witzke, product supervisor for Brush Electronics Co., presented a talk and slides on "Surface Finish Control" at the Fort Wayne chapter's May 11 meeting. He discussed in detail the ASA standard on surface roughness, waviness and lay and explained the operation of the Surfindicator, a production gage for surface finish control.

Coffee speaker was Keith Benward, writer of the Woods and Waters column in the *Fort Wayne Journal-Gazette*. Chairman Josef A. Deck presented Don Batchelder with an ASTE membership pin for bringing in two new members.

*—R. H. Bienz*

GOLDEN GATE—In addition to speaking on induction heating in his capacity of technical director of Tocco Division of the Ohio Crankshaft Co., ASTE President Harry B. Osborn, Jr., commented on national operation of the Society. He is shown at left with Chairman Ted Lindquist. Approximately 130 attended this meeting on May 18.—*John Wilson*

## Tractor Plant Toured by Greater Lancaster

Members of the Greater Lancaster chapter, 130 strong, attended the plant tour of the Caterpillar Tractor plant in York, Pa., on June 14. The tour was preceded by a dinner in the plant cafeteria after which Walter Stevenson, plant manager, described general layout of tooling in the plant, and Kenneth Kirby, education and community relations manager, gave some of the company's history. *—Norman Ressler*

PURDUE UNIVERSITY—Officers of the Purdue student chapter, from left, are: John McMillen, treasurer; C. R. Biteler, chairman; Don Orman, secretary; and Nick Kurek, first vice chairman.

## *Talk on Vibrations Given at Mohawk Valley Meeting*

Addressing the April meeting of Mohawk Valley members, E. J. Moscaret of Consolidated Engineering Corp. discussed the use of vibration measuring instruments. Slides projected during his talk illustrated several typical problems of machine vibration, resulting in short tool life or poor finish quality, where traditional shop measures had failed to establish the cause, but analysis with vibration measuring instruments had shown the answers.

A sound and color film entitled 'Dynamic Measurement" followed the talk. The dinner meeting was held at the Palmer House in Utica.

*—Gordon F. Seely*

## Plastic Tooling Subject of Kalamazoo Meeting

"Plastic Tooling" was the topic under discussion at Kalamazoo chapter's May 24 meeting at Hotel Harris. Speaker was George M. Rice, sales manager for Renite Plastics, Inc., who showed slides of newly developed materials for automotive body dies, fixtures and gages.

Five members were fined 10 cents each for huddling with fellow company employees and ordered to mix with other members. Forty-eight attended this meeting. *—T. J. Cook*

## London-St. Thomas Hears Talk on Grinding

Cemented carbide tool grinding was discussed by O. McIntyre for 96 members of the London-St. Thomas chapter at the Hotel Arizona on May 19, final session before the summer recess. Mr. McIntyre, manager of sales engineering at the Norton Co. of Canada, centered his talk around the use of diamond wheels of three bond types—resinoid, metal and vitrified.

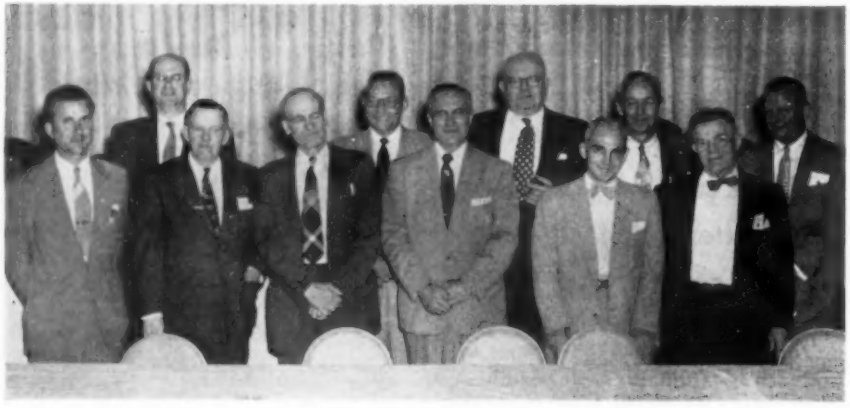
*—Richard J. Merriott*

## Flow Turning Discussed at Nebraska Meeting

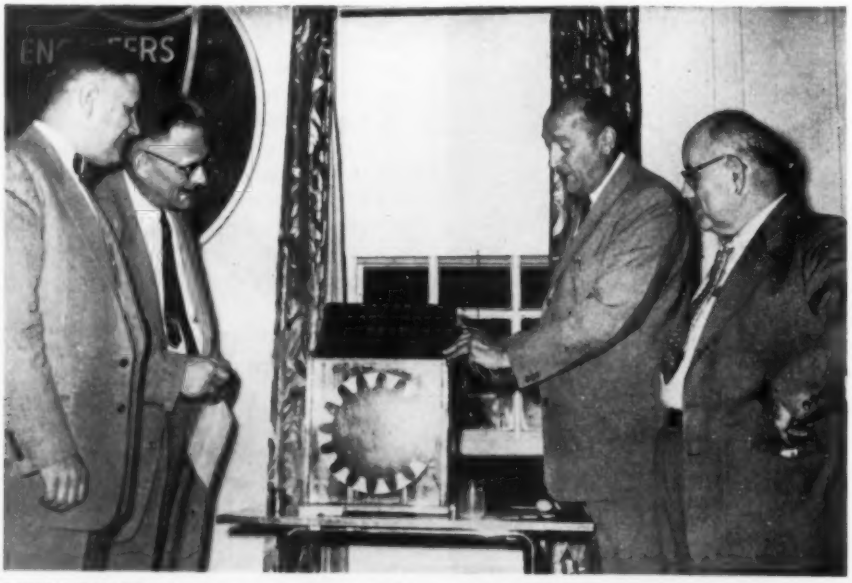
William H. Busch of Lodge & Shipley Columbia, Inc., was the speaker at Nebraska chapter's May 19 technical program. He addressed 45 members meeting at the Birchwood Club in Omaha.

"Flow Turning" was his topic. Samples and slide films were used as illustrations for the discussion. A stimulating question and answer session wound up the meeting. *—Dean W. Roper*

UTAH STATE COLLEGE—New chapter officers were installed by Frederick S. Preator, far right, head of tool engineering at the college and member of the ASTE National Education Committee. From left are: William E. Jensen, chairman; Deon Van Cleave, first vice chairman; William D. Simmons, second vice chairman; Roy Ross Bowman, secretary; and Joe LaBadie, treasurer. On May 20 the chapter held its annual canyon party, with close to 50 members taking part.—*Lewis D. Myers*



DAYTON—Having in common the past chairmanship of the Dayton chapter, all of these men were present for Dayton's past chairmen's night on May 9. From left are: Dick Miller; George Tillotson; George Goodwin, Society director; Earl Johnston; Larry McAfee; Howard C. McMillen, national vice president of ASTE; Edgar Seifreat; Roy Dusseau; Walter Olt; Adam Lensch; and Herman Poock. Mr. McMillen addressed the group on "The Tool Engineer of Tomorrow."—*Robert Bleicher*



PHILADELPHIA—General Electric's "House of Magic" science show was presented May 19 at the ladies' night meeting. Discussing part of the program here, from left, are: Ed Wheeler, first vice chairman; Dick Gross, chairman; William A. Gluesing, program speaker; and Ed Stachel, treasurer.—*S. A. Matthews*

## Santa Ana Valley Holds Junior Engineers' Night

With engineering students from nearby junior colleges and university as their guests, members of Santa Ana Valley were hosts at a junior engineers' night program on June 7. The meeting was held at the Waterwheel Restaurant in Anaheim.

According to an announcement by Paul Jones, Jr., chapter chairman, a special tool design problem has been presented to engineering students in the area, with an invitation to submit drawings to be judged by a committee of ASTE members. —*Leonard Krow*

## John W. Ripple Talks At Little Rock Meeting

John W. Ripple, senior sales engineer for The Carborundum Co., was the guest speaker at Little Rock's May 12 meeting. He spoke before 38 members and guests at the Hotel Marion on the subject "A Million Points for Production," giving the present, past and future of grinding wheels. He also described some methods his company is developing for use in grinding carbide tools.

A special guest of the chapter was Fred Coon who has been an outstanding student in machine-shop class at Little Rock Technical High School.

—*R. A. McKinstry*

## Fashion Show Highlights Albuquerque Ladies' Night

The annual ladies' night program arranged by Nick Sanella was a radical departure from previous meetings of this type. Instead of a lecture or film, the Kistler-Collisster Department Store in Albuquerque presented a style show of ladies' summer fashions. Ninety attended this event at the Hilton Hotel on June 2.

Prize winners included Mrs. G. Johnston, Jr., Mrs. R. M. Burress, Mrs. W. R. Felton, Mrs. D. Durrie, and Mrs. J. R. Felter. —*H. E. Anderson*

## Springfield, O., Chapter Tours Westinghouse Plant

Operations at the new Westinghouse Electric Corp., plant at Columbus, O., were viewed May 19 by the Springfield chapter. Host to 130 members and guests and main speaker was L. F. Revwee, superintendent of tool design. Included on the program was a chicken dinner served at the plant.

—*Kenneth W. Keller*

## Detroiters Hear Dr. Robert F. Pearse

Dr. Robert F. Pearse, executive vice president of Worthington Associates, Inc., discussed "Development of Executives" at Detroit chapter's May 12 meeting.

On May 5 John L. Frank spoke to members of the carbide section of Detroit chapter on simplified methods of reporting tool problems and machine down time. Mr. Frank, special consultant at the McBee Co., discussed actual systems on tool control to minimize inventories, control of down time, production scheduling, quality control and manpower.

The education section of Detroit chapter, numbering 150 attended a plant tour and dinner at Plymouth Division of Chrysler Corp. on May 19. Hosts for the event were David Kilgour, executive assistant at Plymouth, and George E. Dawson, tool and die engineer. The group was privileged to see a second showing of a film on Plymouth Division. —*Walter R. Schober*

BINGHAMTON — General applications of powder metallurgy were discussed for 80 members of the Binghamton chapter by Jerome Kuzmick on June 1. Mr. Kuzmick, president of Welded Carbide Tools Co., is shown right. Also from left are: Ralph Currie, project manager of Powder Metal Manufacturing, International Business Machines Corp.; and Paul Adamek, program chairman. Dave Williams, past chairman, gave an account of his trip to the Los Angeles Exposition.

—*Glyn Williams*

## Program on Ball Bearings Presented at Memphis

Movies and slides showing how ball bearings are made and their use as spindle bearings were shown June 10 at a meeting of the Memphis chapter. Guest speaker was Carl Becher, chief of engineering and design at the New Departure Div. of General Motors Corp.

The film emphasized the close precision work required to manufacture precision bearings. Many steps in the inspection of bearings were illustrated, showing exactly how defects are detected. The slides showed the different types of bearings and where each should be used. Questions and answers rounded out the technical program. —*Ralph Schuring*

## G. A. Cairns Addresses Battle Creek Members

G. A. Cairns, general manager and technical director of Macco Products Co., was the guest technical speaker at Battle Creek chapter's June 13 meeting. He spoke on the development and uses of soluble oils. This occasion was also the chapter's first anniversary.

Chapter Chairman C.F.B. Koons, who is leaving to take a job in California, turned over the chapter charter to H. Palmer Garms, first vice chairman.

—*Arthur F. Damon*

## Fromson Promoted

Robert Fromson, immediate past chairman of the Lima chapter, has been promoted to the position of assistant division manager of manufacturing at the Westinghouse Electric Corp., Lima works. He was formerly division manufacturing engineer.

TUCSON—Don Hinkle, center, field engineer for Micromatic Hone Corp., was the speaker at the June meeting. He spoke on cylindrical and flat honing of parts. Shown with him are John Oberteuffer, left, first vice chairman, and James Matthew, member of the National Program Committee.—*Joseph W. Vincent*

## Positions Wanted

PRODUCTION SUPERVISOR — available. Seventeen years' solid experience in all phases of industrial engineering. Extensive tool and methods engineering. Installed wage standard and job education system. Excellent labor relations record. Solid background in machine tool selection, planning and production control. Age 39—salary and location open. Write to Box 049, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

PRODUCTION AND INDUSTRIAL ENGINEER—with a university education desires new position in Canada or will relocate. Sixteen years' experience in machine tool development and design, automation and simplification, processing and tool engineering, time and motion study, production technique improvement, production control, plant engineering and cost analysis. Write to Box 037, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

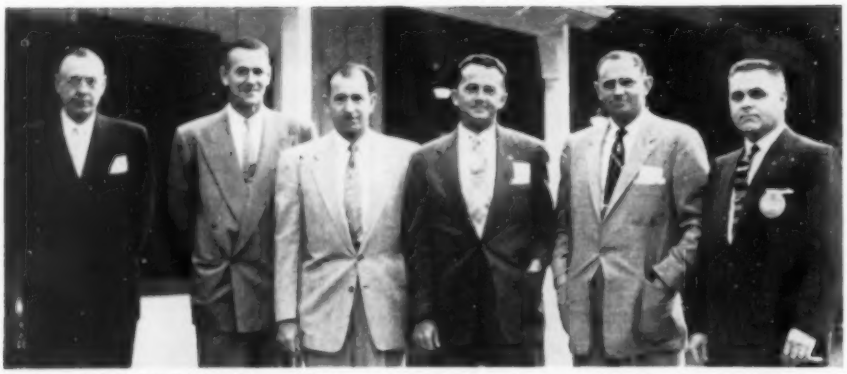
SALES REPRESENTATIVE—with complete tool engineering background now working direct for perishable tool manufacturer of national reputation desires to establish own agency covering Southwestern Ohio. Manufacturers desiring competent coverage in this area are solicited. Write to Box 048, News Department, The Tool Engineer. 10700 Puritan Ave., Detroit 38, Mich.

EXPERIENCED SALES ENGINEER—32, married, presently employed, desires challenging position with compensation commensurate with ability. Will relocate. Available for interview. Write to Box 050, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

## Positions Available

MANUFACTURERS REPRESENTATIVES—needed to handle a complete line of precision taps, drills and gages. Territorities are now open in Wisconsin, Illinois, Indiana, and Ohio. Other territories may be available soon. Earning potential is unlimited with young progressive concern. Prefer men with experience in the tool industry. Write giving full details in first letter to Sales, 16240 James Couzens Highway, Detroit, Michigan.

TOOL ENGINEER—We are seeking a man with creative ability in tool, jig, fixture and die design as related to automatic and semiautomatic, short-run machine operations. Specifically, this positions requires a man with qualifications for design and application of all tooling necessary for machining and assembly operations and tool planning for high productivity at lowest cost. This is an excellent opportunity with a progressive organization. Write to Edward Valves Inc., Subsidiary of Rockwell Mfg. Co., 1200 West 145th St., East Chicago, Indiana. Phone—East Chicago 231. (Convenient to South Shore Trans.)



SAN GABRIEL VALLEY—While on his tour of western ASTE chapters, National President Harry B. Osborn, Jr., fourth from left, visited officers and members of San Gabriel Valley chapter. Shown here, from left, are: Harlan Messner; Alan Howell, chapter secretary; Ed Cutler, chairman; Dr. Osborn, who is technical director of Tocco Div., Ohio Crankshaft Co.; Ben Hazewinkel, ASTE national director; and Lincoln Mager, first vice chairman.—*Everett S. Nance*

## *E. J. Moscaret Addresses Rochester Members*

"Machine Tools and Vibration" was the subject of Rochester chapter's June 6 technical program. Speaking to the group of 130 members and guests was Eugene J. Moscaret, head of the Buffalo office of Consolidated Engineering Corp.

Mr. Moscaret explained the manifestations of vibration, pointing out that minute, high frequency vibrations, transmitted to the workpiece by the tool bit, seriously impair tool life and work quality. The vibrations are often at such high frequency and amplitude that they are not detectable without vibration instrumentation. His talk was highlighted by slides and the film "Dynamic Measurements."

*—Floyd Weed*

## La Crosse Chapter Holds Bosses' Night

When La Crosse chapter held its annual bosses' night at South Lanes on May 24, Jack Turner Wilson, chief physicist for Louis-Allis Co., was the guest speaker. "Power from the Atom and Power from the Sun" was the subject of his talk.

Mr. Wilson stated that we are not really in the atomic age, but the electrical age because all we are doing so far is transforming atomic energy, the basic source of energy from the sun, moon and stars, into electrical energy to enhance already-existing electrical power.

Coffee speaker was C. M. Smillie, one of ASTE's thirteen national directors.

*—Miles J. Sullivan*

## Hamilton Members Hear C. G. Ouseley

A May 13 dinner meeting of Hamilton District chapter brought Campbell G. Ouseley, in charge of Utility Tool Division of Black and Decker Mfg. Co. before the group. He was accompanied by H. R. Abrahams, also of Black and Decker.

*—W. A. Marcellus*

## Diamond Mining Topic at Central Pennsylvania

How diamonds are mined in the world's principal mining areas—their processing, sorting, grading and distribution to the various fabricating companies was the subject of Central Pennsylvania chapter's technical session on May 4.

Principal speaker was D. A. Trescott, assistant sales manager for Super-Cut Distributors, Inc. The meeting at West York Inn was attended by 28.

*—Paul F. Leese*

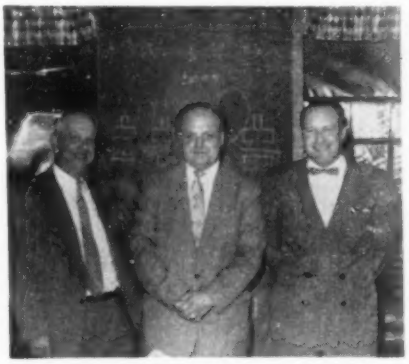
ASTE Industrial Exposition and 24th Annual Meeting will be held March 19 through 23, 1956 at Chicago, Ill. The Exposition will be held at the International Amphitheatre.

## *ASA Names Society As Committee Sponsor*

ASTE has been named as co-sponsor of the American Standards Association Sectional Committee on Small Tools and Machine Tool Elements.

The appointment, made by the Mechanical Standards Board of ASA, has been announced by William Moreland, chairman of the ASTE National Standards Committee.

C. H. Borneman of General Electric Co. in Schenectady, N. Y., is the ASTE representative serving on the committee, which is known as B5. Other sponsoring associations include: ASME, NMTBA, SAE and MCTI.



CALUMET AREA—Prof. L. J. Schnitzer, center, discussed the trend in tooling on May 9. He is flanked by R. L. Schirmer, left, and George Du Walt, engineers for International Cash Register.—*L. W. Montgomery*

LA CROSSE—Special guests and officers are shown at the LaCrosse chapter's May 24 Bosses' Night. They are: front row, from left: R. N. Phillips; C. M. Smillie; A. W. Graw; R. Denzer; A. M. G. Moody; and J. W. Hopkins. In the back row are: D. C. Minard, T. R. Wiseman; Sid Wall; F. J. Papenfuss; and J. T. Wilson, chief physicist for Louis Allis Co., who was guest speaker.

## Three Montreal Members Present Chapter Program

Winding up the technical meeting of the season, three Montreal members shared the spotlight at the program held on May 25. Speaking to the chapter were: T. C. Hill, tool controller at Canadian General Electric Co.; W. Koskosin, industrial engineer at Canadian Marconi Co., Ltd.; and L. Labelle, supervisor of tool design at R.C.A.

Mr. Hill's topic was "Tooling for Modern Products." Mr. Koskosin spoke on "Tooling Considerations Applying to Short Runs," while Mr. Labelle discussed "Automation Programming."

*—L. Armand Beausoleil*

## Los Angeles Hears Die Casting Panel

A panel of die casting experts discussed "Die Casting and the Tool Engineer" for 210 members and guests of the Los Angeles chapter in June.

In addition to the panel discussion a 30-minute color film entitled "How Else Can You Make It," produced by the American Die Casting Institute, was shown. Program chairman was Hugh R. Rice.

The Los Angeles chapter was host to the graduating class in tool design of Los Angeles Trade Junior College at this meeting. *—Roland Hamel*

## Harry Conn Addresses Chautauqua-Warren

Production tooling problems were discussed by Harry Conn, chief engineer for Scully-Jones & Co. at Chautauqua-Warren chapter's May 19 meeting held in the Glade Township Firehall.

To speed the solution of problems, Mr. Conn suggested the use of charts with all possible causes listed and probable amount these affect the problem.

New members of the chapter are John L. Fortuin, Clarence H. Benson, Karl J. Erik and Raymond W. Norris.

*—Walter Carlson*

## Vibration Engineer Speaks at San Fernando

Machine tools and vibration was discussed by Donald Schneider for members of the San Fernando Valley chapter at the June 2 meeting. Mr. Schneider is vibration engineer for Consolidated Engineering Co. Four new chapter members were introduced who are: Roland Henscke, Lon Whittington, Byron Goodnight and W. C. Crain.

*—Sam Schwartz*

**LOS ANGELES—Paul B. Slater, Los Angeles chapter chairman, welcomes panelists who discussed "Die Casting and the Tool Engineer" at the June 9 meeting. Panel members include: Art Townhill, director of engineering, Harvill Corp., panel moderator; Curt Levinson, partner, Withrow Die Casting Co.; Paul Harlow and Ray Felix of Rangers Die Casting Co. The panel represented the American Die Casting Institute.**

**WESTERN RESERVE—"Operation Pushbutton" was presented by The Bellows Co. at the April 25 meeting. The film portrays automatic operation of machinery and equipment through pushbutton control. Pictured here, from left, are: Ed McCabe, second vice chairman; Gene Helfer, first vice chairman; Ray Beatty, chairman; and Mr. Boese of Bellows.**

## Life Membership Requirements Outlined

In answer to many questions about who is eligible to receive Life Membership in ASTE, here is background information on requirements for achieving the highest honor the Society can bestow upon a member.

Life Membership in the American Society of Tool Engineers is not easy to attain. The award is made for particularly outstanding service of *national* impact, and with but two exceptions, all recipients have served as national presidents of the Society.

Upon retirement from office, an ASTE president receives Life Membership in recognition of his many years of conscientious work for the Society which culminated with service in the highest elected office. The award is made at the annual banquet by the incoming president in behalf of the Board of Directors.

Life Memberships that have gone to other than Society presidents were presented to Roy Bramson for the work he did in the early days of ASTE in establishing THE TOOL ENGINEER as the Society's official magazine, and to E. W. Ernst for the contribution he made in heading up the successful *Tool Engineers Handbook* activity.

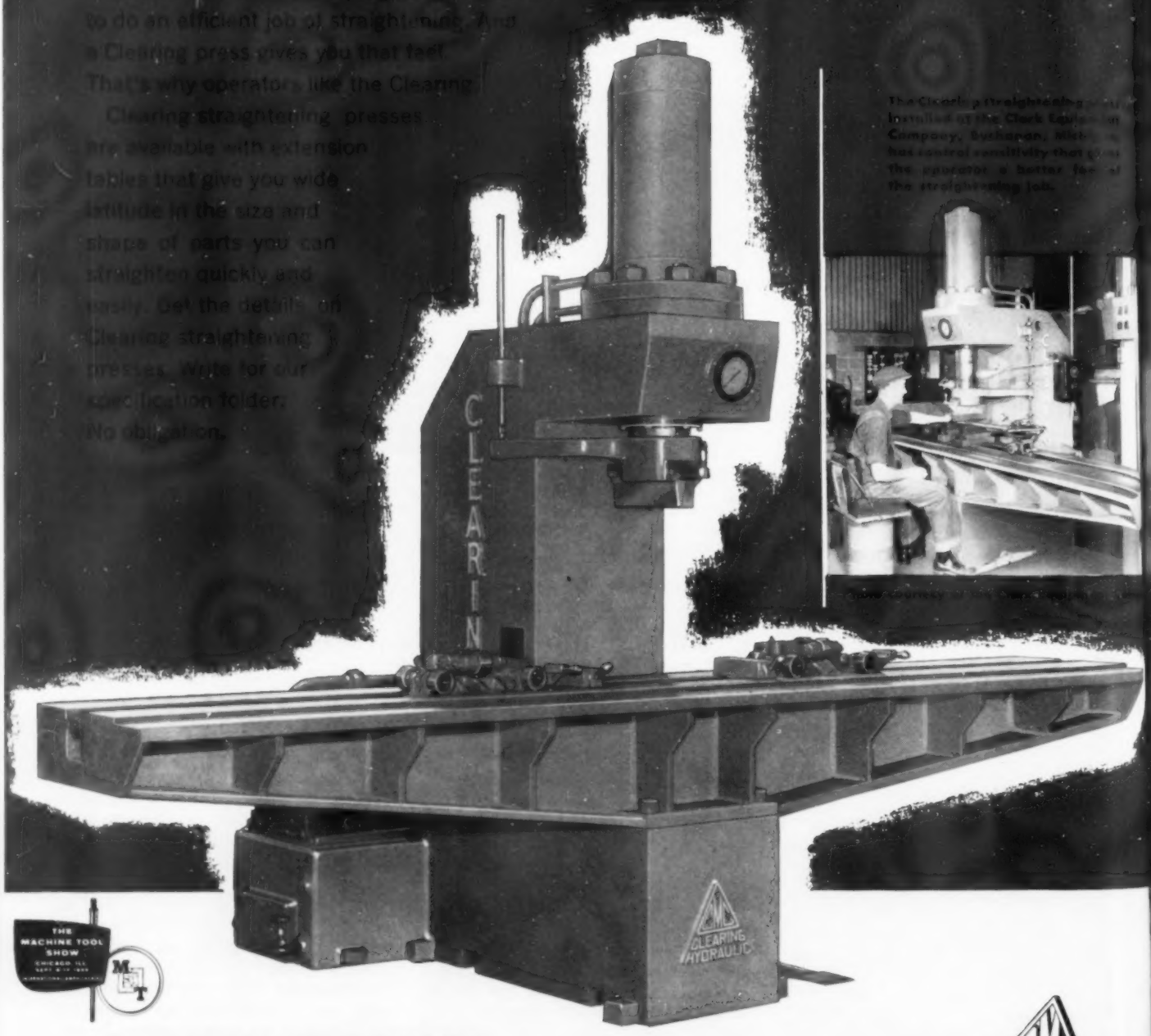
Philosophy behind the Life Membership award emphasizes the importance of service to the entire Society, service felt directly or indirectly by all members, not just a small segment of the organization.

# Here's a straightening press that HELPS your operator

# It's a CLEARING

You bring the anvil down to the work, then step on the foot control. The machine reacts to your movements as if it were a mechanical part of your own nervous and muscular system. The bar you're straightening bends in response to the pressure you exert with your foot . . . just the right amount . . . release the pressure . . . gauge the part . . . it takes a combination of judgment and feel to do an efficient job of straightening. And a Clearing press gives you that feel. That's why operators like the Clearing.

Clearing straightening presses are available with extension tables that give you wide latitude in the size and shape of parts you can straighten quickly and easily. Get the details on Clearing straightening presses. Write for our specification folder. No obligation.






The Clearing straightening [illegible] installed at the Clark Equipment Company, Buchanan, Mich., has control sensitivity that gives the operator a better feel of the straightening job.

THE MACHINE TOOL SHOW CHICAGO ILL.

## CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

**CLEARING MACHINE CORPORATION** DIVISION OF ***U.S. INDUSTRIES, INC.***

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS • HAMILTON PLANT — HAMILTON, OHIO

# PROGRESS IN PRODUCTION

## TAPE AUTOMATED MILLING DEMONSTRATED ON PRODUCTION PARTS

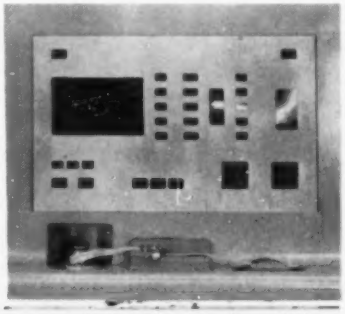
Milling large, complicated workpieces on heavy-duty planer-type milling machines controlled by magnetic tape was demonstrated recently at the Giddings & Lewis Machine Tool Co. The system, in which entire work cycles are programmed solely from numerical data, is the result of three years' company sponsored research at Massachusetts Institute of Technology and allied research at General Electric Co.

"Numericord" machining operates from magnetic tape recordings prepared with simple, decimal number information taken directly from part blueprints. Application of this development in machine tool automation was demonstrated in the control of all functions of a spar and skin milling machine making the various cuts necessary to produce complete, sculptured wing and skin panels for jet aircraft from 75 ST aluminum plate. This system, which is applicable to virtually any kind of machine tool, is considered the first practical application of completely automatic control to skin mills or other large machine tools. Estimates indicate that savings in aircraft skin milling operations where maximum advantages are utilized, can reach 50 percent of time consumed in conventional methods.

With Numericord, nonproductive operations such as tool setting, gaging, template changing and positioning are eliminated. Other time and material losses involved in wasted operator motions, lack of skill, miscalculations, human error and print checking are obviated also. Complex cycles of operation, involving multiple tool heads and machine motions in as many as three dimensions, are completely planned and engineered by mathematical computations and electronically recorded on magnetic tape. This tape is then used to control all machine functions automatically, repeating the recorded machining program to produce identical parts in any quantity.

Essentially, four individual components make up the Numericord machine tool control system: the paper tape preparation unit, which punches a master numerical tape with previously calculated decimal information from part blueprint, tooling data and machine feed and speed specifications; electronic director, which converts information from the paper tape into electrical command signals impressed on appropriate parallel channels of a magnetic tape; the control unit which "reads" commands off the magnetic tape and sends electrical control signals to the machine; and the electromechanical apparatus which controls machine response to command signals.

Paper-tape preparation and electronic-director portions of the system are independent of the machine tool. Installed remote from the shop, they can be used to prepare magnetic tapes for any number of machines and vari-



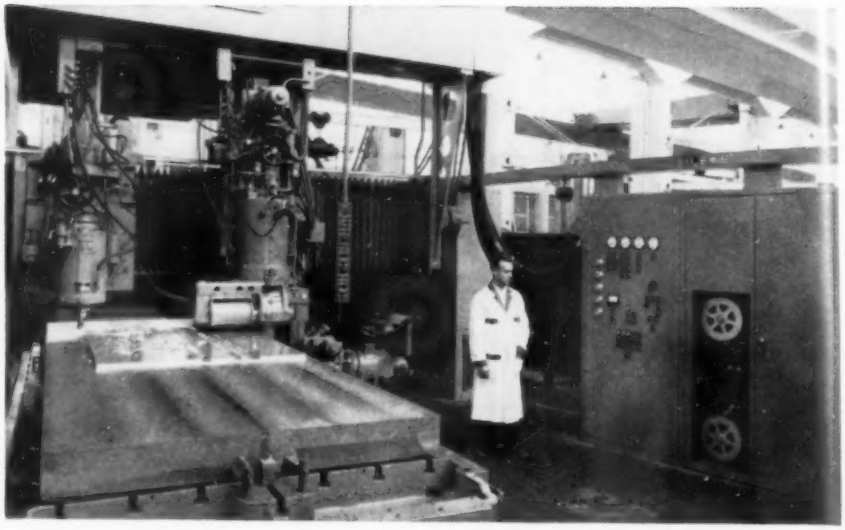
**Left. Paper tape preparation unit operator in foreground transcribes previously calculated numerical data. Electronic circuits in the unit verify accuracy of data. Punched paper tape is then fed through director unit in background to produce magnetic control tape.**

**Right. Closeup of paper tape reading mechanism and control panel of the computing director unit. The tape reading device is automatic in operation. Repeaters visible on control panel provide means of checking tool positions, as though an actual machine operation were being performed. An illuminated trouble signal indicates if any circuit fails to function properly.**

ety of parts to be machined. Backlogs of tapes can be maintained for part change-over in production schedules.

A novel, yet practical feature of the system is the possibility of including audio signals in the magnetic tape. These can be used to alert the machine attendant of needed tool changes, "planned" stops for machine inspection and completion of machine cycles. Such loud speaker commands, transcribed on unused channels of the tape are synchronized with automated machine movements and add materially to the versatility and efficiency of the operation.

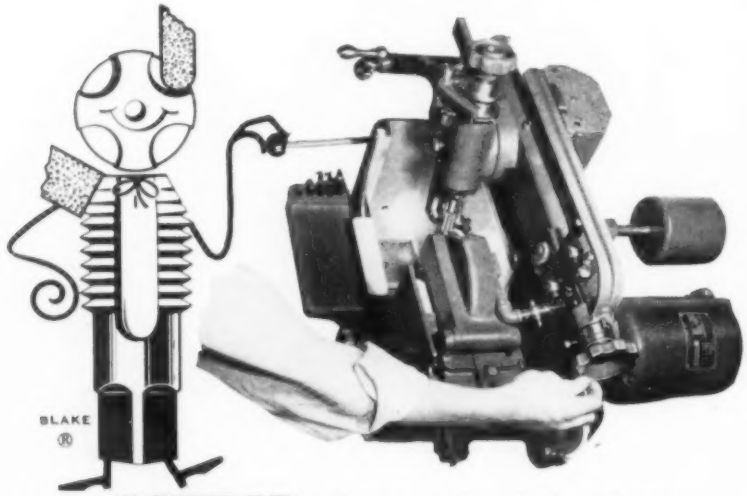
Another potential advantage of the development is that engineering and production information may be conveniently stored for future use, or it can be quickly and easily transferred from one plant to another. For complex machining, such as airframe components, skilled manpower can be conserved by use of less skilled operators, because with this system machining accuracy is a product of engineering planning in the tape preparation stage and is independent of the machine operator.



**Here a tape-controlled skin milling machine is performing typical milling cuts for integral skins. Machine attendant stands in front of the magnetic tape play-back unit. Behind him is the control unit housing electronic circuits and amplidyne generators for powering the machine's servos.**

Many of the G & L heavy-duty machines, such as horizontal boring, drilling and milling, planer-type milling and vertical boring mill machines, in addition to skin milling machines are now being offered with the new automation system or modifications, according to officials. Flexibility of the system is apparent from the fact that tape play-back and machine control positions can be used independently to produce magnetic tape recordings from manual or template-control operations on trial parts. The recording is then used to produce automatically any number of subsequent pieces. Also, the standard electronic computers of the director portion of the system can be used to short cut manual calculations prior to punching the paper tape with data to be fed into the director unit.

In its present state of development the G & L system can automatically control as many as five simultaneous machine motions or tool heads and 22 separate auxiliary machine parts including lubrication, coolant and chip conveyor systems. Inherent accuracy of the magnetic tape method is under 0.0005 inch—with resulting accuracy in machined parts ranging within 0.002 to 0.001 inch.


Get **BETTER** threaded holes,
**MORE** threaded holes with
Blake "Tapsaver" Grinders

**ACCURACY** . . . of taps ground by Blake Flute and Chamfer Grinders keeps threaded-hole production high and uniform.

**CONSISTENCY** . . . of threads cut with Blake-sharpened taps speeds up assembly and inspection operations.

**SAVINGS** . . . result from both decreased tap costs and increased productivity when taps are kept sharp the Blake way.
You Can Keep Your Taps Sharp!

and here's the Proof

Write for these booklets

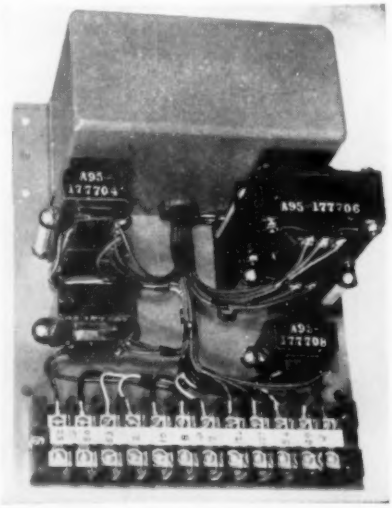
EDWARD **BLAKE** COMPANY INC.
450 CHERRY ST., WEST NEWTON 65, MASS.
BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-142

## SAFETY CIRCUITS EMPLOY TRANSISTORS

Redesign of its antirepeat electrical control circuits to incorporate transistors instead of relays for switching functions has been announced by Clark Controller Co., Cleveland, Ohio. These circuits employing transistors give safety antirepeat control on all presses which have clutches or brakes or a combination of the two, that are operated by air pressure.

By utilizing transistors, engineers have provided the mechanism with longer life (because transistors have no moving parts), and have considerably simplified the circuitry.



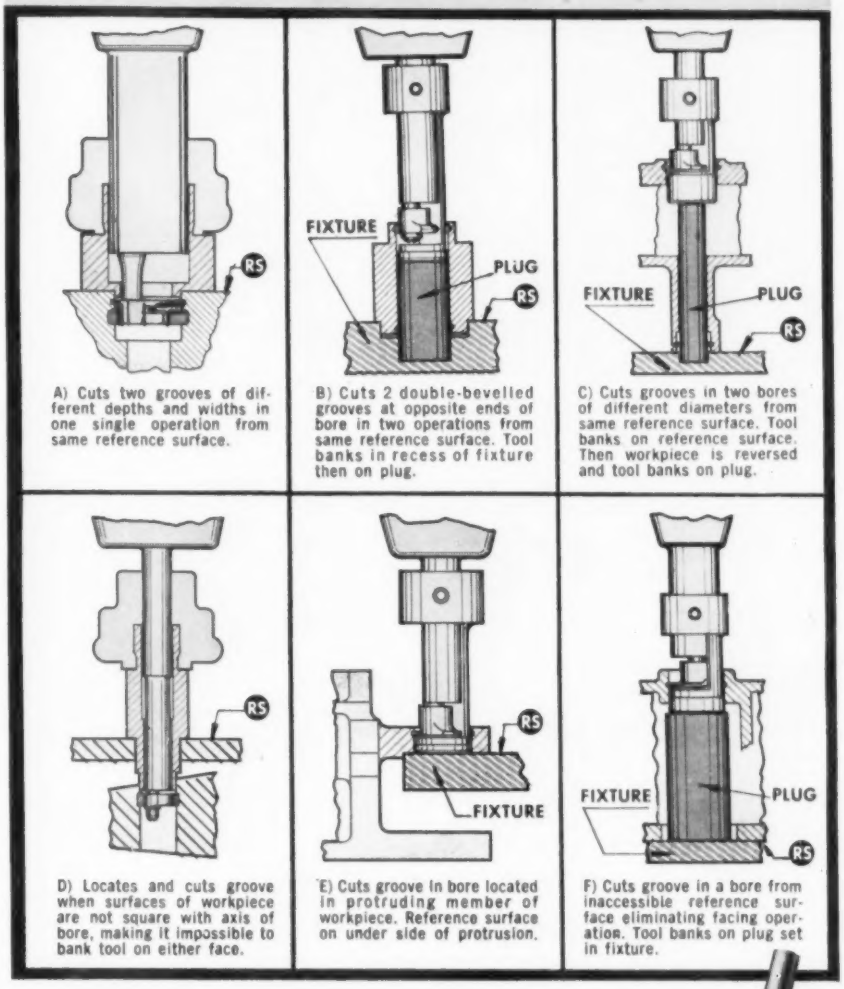
**Transistors are used to replace relays in the design of this press antirepeat control prototype.**

## NEW CASTING PROCESS SAVES TIME AND DOLLARS

Development of a system for casting stable forging dies from beryllium copper and other castable metal alloys offers industry means for saving considerable time and money. In the aircraft industry, particularly when accelerated production schedules had to be met, time lag in forging procurement has meant that enough parts for at least the first ten aircraft had to be machined from bar stock. The time element involved multiplied when several airplane models were being tooled. At a time of mobilization this could be disastrous.

In the USAF's present heavy press program this technique could, for example, find particularly useful application. At North American Aviation's Columbus Div., where it was developed, engineers estimate that use of the technique will cut the present average of three to six-months' lead time in forging procurement to three to six weeks. Furthermore, cost of die tooling may be


**Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!**




A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

**Amazingly versatile!** Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

**Wide Cutting Range!** The Waldes Truarc Grooving Tool comes in 5 models... enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

**Send Your Problems to Waldes!** Send us your blueprints... let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

WALDES TRUARC® GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,411,426

TR087
Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.
Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)
Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____

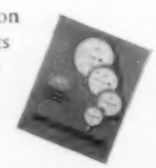
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-143

*. . . the preferred dial indicators*

TIME-TESTED FOR ACCURACY AND DEPENDABLE PERFORMANCE!

For more than half a century, industry has relied on Ames indicators for help in the solution of measurement problems of all kinds. And through the years, Ames indicators have done their jobs superlatively well. The Ames reputation for extreme accuracy, ruggedness and reliability through many millions of cycles is due to an unswerving dedication to our original guiding principle—to make the best possible indicators and gauges, through constant research and the use of highest quality materials and expert craftsmanship.

We will gladly make recommendations on your measurement problems. Please send blueprints and specifications. And ask for your free copy of the Ames catalog.



*Representatives in principal cities*

B.C. AMES CO.

*30 Ames Street, Waltham 54, Mass.*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-144

reduced by as much as 75 percent. In this connection, one example cited is a set of forging dies produced by normal die sinking methods at a cost of $2,000; the same set, cast from the alloys cost about $550.

At present high-quality production forgings of aluminum, steel and magnesium are being struck from castable remeltable alloy dies for North American Aviation. The forgings are of high quality and are being produced in quantities that meet normal aircraft production demands. To date, parts weighing from 8 oz to 50 lb have been produced by the new technique.

Besides their economy, the cast dies have other advantages, one of which is

**A hydraulic fitting, just forged, is being removed from the die block by press operator Ray D. Hyer, foreman of the forging department at D. L. Auld Co. The part is used on the North American FJ-4 Fury Jet.**

the self-lubricating feature of the die metal. Beryllium copper takes on a burnished finish after the first three or four parts have been forged, because a film of oxide, caused by heat and repeated pressures, forms on the die surface. With magnesium, the self-lubricating feature permits parts to be removed easily without use of knockout punches. Die cavity finish is superior at the end of runs with either 75S aluminum or AZ80 magnesium, and the surfaces of the forgings themselves are generally superior to those produced from steel dies.

The technique promises to be useful even in extended production runs of steel parts. One steel forging firm already has obtained a run of 17,000 steel parts from a beryllium copper die sunk in rolled bar stock which has properties comparable to a process cast beryllium copper die.

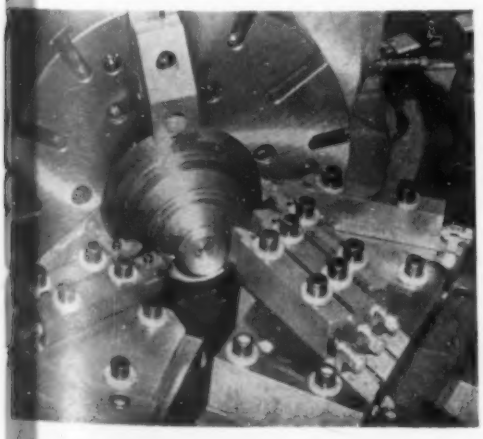
## NEW QUICK-CHANGE METHOD SIMPLIFIES TOOLING

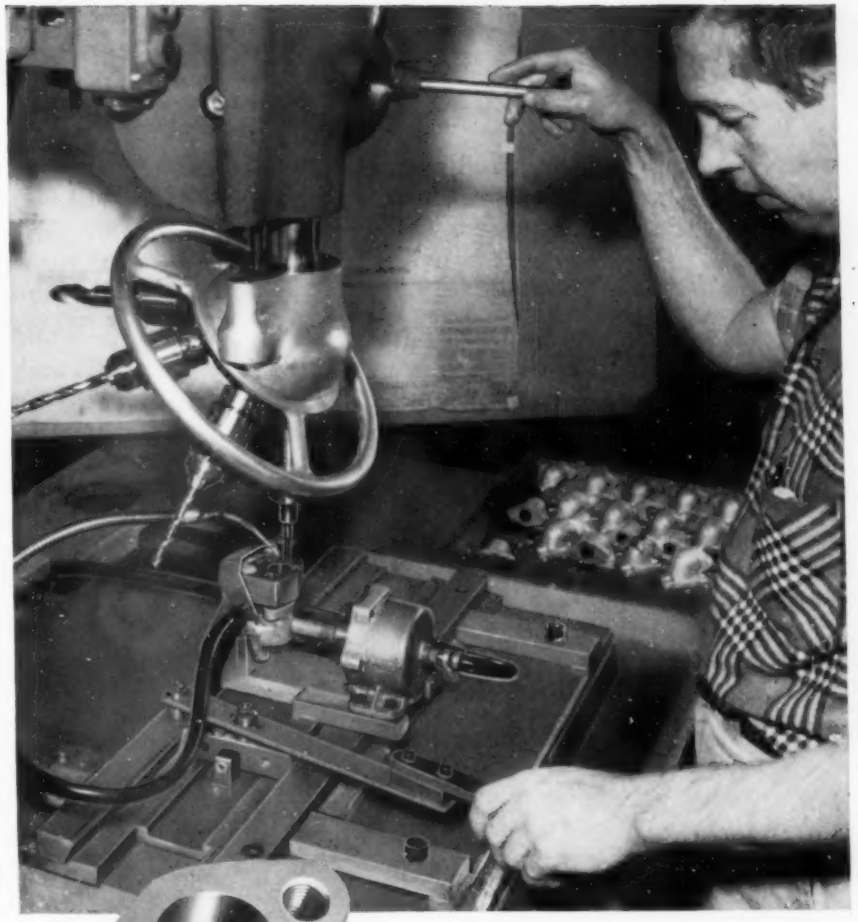
Stock removal from rough forgings is being done with economy and efficiency as a result of a simplified quick change tooling method reported through Kennametal, Inc. In the new method, clamped tool holders are bolted directly on riser plates on machine carriages, thus avoiding use of regular tool blocks.

Several advantages are thus provided: There is considerable chip clearance; cost is lower than conventional tools plus tool blocks; tools are closer, avoiding the need for in-between support; and the clamped tool inserts are readily accessible for rapid changing. In addition, the method permits rapid changeover from one size workpiece or operation to another on the same machine. By loosening only four bolts, the entire riser plate with the positioned tools may be removed.

Efficiency of the system was demonstrated by two jobs recently tooled by Gisholt Machine Co. One of these (illustrated) involved grooving operations on SAE 4815 drill cone blanks, which were performed with special Kennametal clamped insert tools. Feed was 0.004 inch while speed was 159 rpm and 300 sfm maximum. Depth of the plunge cut was 5/8 inch. Cones for eight sizes of oil well drill bits, each requiring three differently shaped cones, were machined on a Gisholt Simplimatic automatic lathe. Changeover in cone sizes and shapes was simplified by riser plate tooling which was employed to bolt the tool holders in position as shown in the photograph. Inserts with 120-degree angle V bottoms were employed to overcome side thrust. Tool holders provide forward adjustment.

In another job separate riser plate tooling was used at Gisholt for each of six operations on an automatic production lathe which was used to machine rough drive gear forgings. Machining included turning, facing, chamfering and forming web radii.



PRODUCTION UP 53%

FEWER REJECTS

**HOWE & FANT TURRET DRILL CASE HISTORY**

**#25**

Part — Aluminum elbow

Fixture — 3 position, lever transfer, air clamp, bolted to machine table.

**Operations**

**I** Load. **II** Spot 2 holes 3/8 x 90°. **III** Index turret and drill 2 holes .272" dia. .625" deep. **IV** Index turret and tap 2 holes 5/16—24 class 3 fit .520" deep. **V** Index turret and core drill 1 hole .801" dia. .410" deep. **VI** Unload and clean.

Production rate — 73.2 pieces (512.4 machining operations per hour).

**Comment**

Job is a "natural" for the H&F turret drill. Part is clamped by air in simple fixture lever actuated to provide 3 predetermined working positions. This assures minimum transfer time and proper location of part under working tool. Each tool turns at optimum preset speed in this case:

| | |
|---|---|
| Spot drill | 1825 r.p.m. |
| .272" dia. drill | 2375 r.p.m. |
| 5/16—24 tap | 1150 r.p.m. |
| .801" dia. core drill | 825 r.p.m. |

Tap automatically reverses at twice forward speed at preset depth. All depths controlled within .002".

Set-up increases production 53% over 4-spindle drill press with box jig. Rejects are virtually eliminated, tool life greatly increased. The H&F installation has won unanimous operator approval by appreciably cutting fatigue while increasing output.

WRITE FOR THE H&F CATALOG AND FURTHER TIME STUDIES

hf HOWE & FANT, Inc.

28 FITCH STREET • EAST NORWALK • CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-145

# Report to Cylinder Users . . .

Here at Miller Fluid Power we have a pattern which we follow. A goal at which we are shooting. The pattern isn't too simple. And the goal isn't an easy one. But we've been making progress. Our position right up in the van of the industry proves that.

Our job is the production of cylinders. Basically, there's nothing anyone can do to alter a cylinder. It was old a hundred years ago. It probably won't change basically in another hundred years. But in the details of the cylinder, change is the major element.

Which is very much like industry itself. Basically industry has not changed since free enterprise was conceived on this continent. But in every detail it changes from year to year.

### *It's the Thousandths That Count*

There was no single big thing wrong with the cylinders being manufactured yesterday. Just a lot of little things. So Miller Fluid Power made the improvement of little things its business.

We experimented with new materials and made safer, more dependable steel heads and caps. We hard-chrome-plated 110,000 PSI yield point steel to improve radically the piston rods. We raised the efficiency of operation to new peaks. Striving for quality in the smallest detail we improved in a dozen parts which are hidden from sight.

For instance, most cylinders leaked in operation. Miller made one that wouldn't leak. To prove it, we went away out on a limb and guaranteed leak-proof operation. And made the guarantee stand up.

### *We Learn by Listening to You*

We saw our customers as thousands of men in thousands of shops wrestling with thousands of production problems. We made those problems ours and produced cylinders to whip those problems. Maybe we didn't revolutionize the cylinder business in the process. But we sure helped. We know that.

We learned to produce what we believed was the best cylinder on earth. We also learned that the best cylinder today wouldn't be good enough tomorrow. So, with the good one in production, we listened some more, experimented, and came up with a better one.

Miller Fluid Power is a young company in an old field. We are young, progressive, and willing to listen. We innovate without being prodded.

### *Discussion is a Two Way Street*

On occasion we like to have others listen to us. Especially when what we have to say will help our customers. That is the idea behind our College of Cylinder Knowledge. We know a lot about cylinders. Though not as much today as we will tomorrow or the day after.

In our College of Cylinder Knowledge we try to show you what good cylinders can do for you. And what you should demand in any cylinder you buy. We meet other men who know what they want in a cylinder. We listen to their wants and try to explain what perfection in detail means.

We believe that when the users of cylinders sit down across the table from the producer who is trying to make the best, better cylinders result.

We'll be carrying that belief into the Production Engineering Show at Navy Pier in Chicago on September 6. Our College of Cylinder Knowledge booth will be open for that kind of discussion. We'll listen and learn.

The only way we can learn is from you. We can help you. But not until you've dropped that problem of yours in our lap. Your problem contains the stuff of which the better cylinder will be made. The cylinder that will have that quality plus which we like to think is the stamp of Miller Fluid Power.

Remember this when you see the sign over Booth 1819-23. We'll be there to listen to your suggestions, demands and questions. Also, because we are in the cylinder business, we'll be there to show you a cylinder you will want to buy.

*Frank Flick*

*President*

**MILLER FLUID POWER COMPANY**

2010 N. Hawthorne Avenue

**Melrose Park** **Illinois**

***Visit Miller***

**BOOTH #1819-1823**

***Production Engineering***

NAVY PIER **SHOW** CHICAGO

# TOOLS of today

## Automatic Screw Machine

Fast automatic operation on all materials from free cutting plastics to alloy steels is provided by the unit announced by Brown & Sharpe Mfg. Co., Providence, R. I. The new No. 00 takes stock up to ½ in. with 1-in. turning length, or up to 1½ in. with special equipment. Its spindle speeds range from 34 up to 7200 rpm max, with 208 combinations of high and low speeds in ratios from 2.3:1 to 16:1. Selection of speeds and direction is made by simple pick-off gears. Eleven change gears give the complete range of 120 production rates from ¾ to 100 seconds per piece.

The one-piece base of the unit, which provides excellent rigidity, houses the main motor and the spindle driving mechanism.

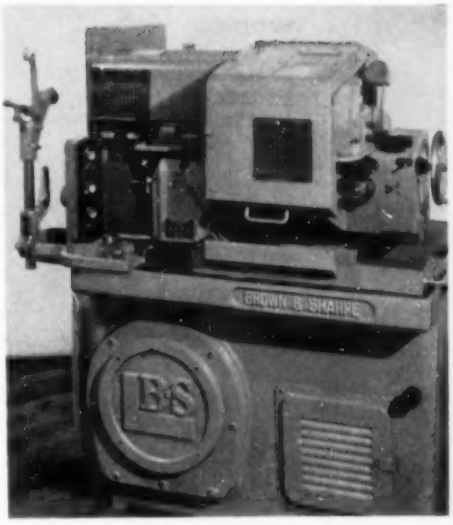
On this unit the vertical slide is standard equipment, permitting an additional tool position.

Pushbutton control, which governs both spindle and driveshaft, plus other engineering features, shorten setup time and reduces operator supervision as well as chance for human error.

An important safety feature is that the driveshaft handwheel does not rotate when the machine is in operation, and it is designed to move out of the way with the compartment door when gears are changed.

Among attachments available for the unit is a skip index attachment that provides increased production on deep drilling operation. Another is the brake-in-neutral attachment that permits the use of both high and low speeds on jobs where provision must be made to stop the spindle automatically.

**T-8-1471**



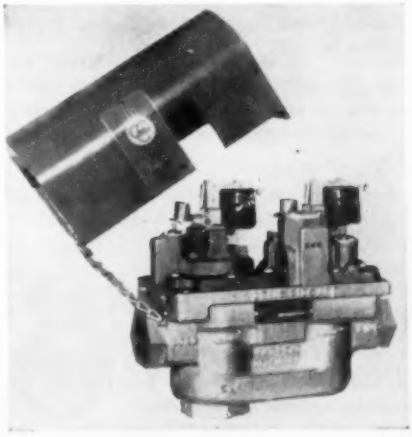

## Press Protector Valve

Safety for operators of metalworking presses utilizing air-operated clutches or brakes is considerably increased with the new protector valve developed by Clark Controller Co., Cleveland, Ohio. This Type PV dual protector valve, which incorporates an operating unit with a standby safety unit, is installed on a press as an auxiliary guard. The unit is a 1¼-in. piloted valve designed to operate at any pressure between 25 and 100 psi. Normally it is furnished with 110 electromagnets.

Ordinarily, dual valve systems are part of press design. However, in these systems, the safety valve also operates with each stroke of the press and is subjected to the same factors which cause failure in the operating valve. By comparison, in the Type PV protector valve only the operating unit moves with the press stroke. The safety unit is not subject to this wear and stands by ready to function only if the operating unit fails. The possibility of simultaneous failure is improbable. When the safety unit does operate, it is then locked in that operated position and cannot be reset until the fault which caused the action is corrected.

Simple to maintain, the valve can be completely serviced without disturbing piping.

**T-8-1472**



## Precision Lathe

Developed for both manufacturing and toolmaking applications, a Series EE, Model 1000, precision turning lathe is announced by the Monarch Machine Tool Co.

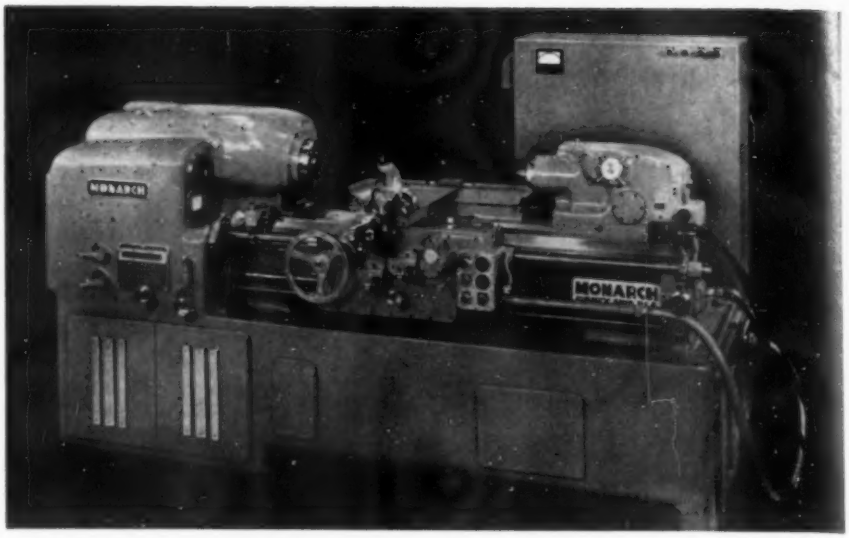
Design feature of the lathe is the all-electric infinitely variable cutting speed control mechanism. A single electric control knob provides any desired speed within the particular range selected. Four hydraulically actuated speed ranges—covering, forward and reverse, any speed between 25 and 2000 rpm—are available and shift automatically upon the setting of a

range selector switch. Both the speed control and the shift are located convenient to the operator at the apron.

In the four speed ranges, the first three are geared ranges, while the fourth range is direct through a multiple V-belt drive.

The machine also is equipped with built-in constant surface cutting speed for work accuracy and finish.

An electronic rectifier system, located in a separate electrical control cabinet, provides power for the machine's 20 hp, d-c variable speed main drive motor. This system has sufficient capacity to operate the motor at 30 hp without excessive overloading. The operator can constantly supervise the motor load by the "spindle motor load" meter, installed on the front of the control cabinet.




Motor control and load compensation, also housed in the control cabinet, are handled electronically by means of vacuum tubes and relays. Load compensation control keeps motor speed constant within 5 percent from no load to full load at any particular speed setting. Full 20 hp of the motor may be used at speeds as low as 107 rpm in low range. Below that speed armature control provides constant torque down to 25 rpm.

Request further information about the Model 1000 precision turret lathe directly from Monarch Machine Tool Co., Sidney, Ohio.

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Variable Speed Transmission

Speeds from 7500 rpm to zero are had from the Model 30MS5. This drive is particularly designed by Graham Transmissions Inc., Menomonee Falls, Wis., for high-speed, wide-range applications such as tachometer testers, small generator drives or test equipment. A feature of this new unit is that the torque delivered by the transmission increases as the speed increases.

High accuracy of control is obtained over the entire speed range through the use of a micrometer control furnished as standard with the transmission. The drive will hold accurately at a preset speed and may be reset exactly to a predetermined setting.

The transmission can be had without motor or with many types of built-in motors. It also is available with a variety of reducer assemblies for applications where a wide range of accurate speeds must be had at reduced top speed. **T-8-1481**

ANOTHER *American* FIRST

**3 parts assembled from 3 different angles**

**IN ONE AUTOMATIC MACHINE OPERATION**

Parts magazines (indicated by arrows) are loaded with bushing and plug parts. Push button starts machine cycle, case is automatically clamped, and bushing and two plugs are pressed into case simultaneously by hydraulic cylinders.

Designed for an automotive conveyor-type assembly line, this American Hydraulic Press inserts a bushing and two dowel plugs in an automotive transmission case — all three parts from different angles — in a single, push-button controlled, automatic cycle. It is a typical result of the service that American offers for designing and building automatic assembling and broaching equipment.

American's experience in developing machines for special purpose production operations can be of real value to your planning. Engineering versatility is a proven American asset.

A letter or phone call outlining your requirements will be welcomed — and will produce prompt cooperation.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN
SUNDSTRAND
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-148

## Saw Band

Latest saw band development of the DoAll Co., Des Plaines, Ill., is a high-speed steel tool with positive rake teeth to give high penetrating ability, cutting speed and tool life.

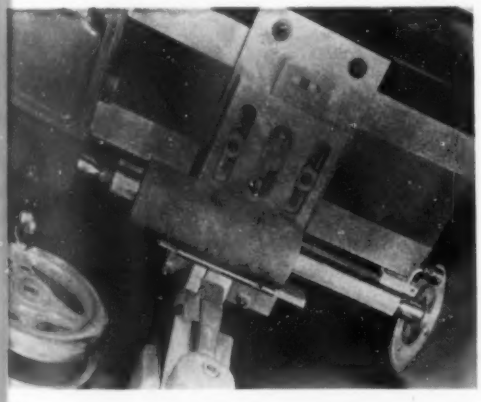
The new saw, called the Demon high-speed steel Claw Tooth saw band, is a further development to DoAll's high-speed steel blade announced earlier. It has teeth of a positive rake or hook form that permit much faster cutting rates with less effort because they penetrate easily with less feed pressure. They also withstand more cutting action before dulling, and they have less tendency to scuff and wear especially at the beginning of a cut.

Demon high-speed steel Claw Tooth is being offered in four widths from ¼ through 1 in. and in four pitches.

**T-8-1491**

## Centerless Grinding Fixture

A centerless grinding fixture which will convert any "between centers" grinding machine to a centerless grinder is announced by S & E Machine Products, Inc., Bridgeport, Mich. Such operations as through feed, in-feed, plunge or form grinding are practical with the fixture, which provides all ele-



ments necessary for accurate grinding of round work, without the need of setting it up between centers.

The lightweight unit can be quickly set up on a machine, and is also easy to remove. Although the fixture is strong, precision built and designed to stand long production runs, it is economical for lots of a few pieces.

The machine on which the fixture is applied provides the grinding wheel and its motivation. The S & E unit provides the regulating wheel and the work rest blade support with the means to secure alignment and adjustment for various diameters of workpieces.

**T-8-1492**

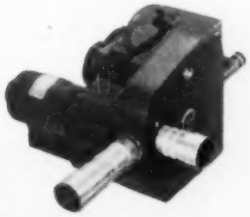
**When it sings out, engineering mysteries unfold**

The high-pitched whine of a high speed camera is bursting forth more and more often in modern engineering laboratories. For engineers have found that ultra-slow-motion movies make trouble shooting in fast-moving parts more a matter of intelligent visual analysis than of tedious cut-and-try experimentation or calculation. And that leaves them more time for design and development work.

The high speed camera we make is primarily for the practical engineer to use in helping solve his day-to-day problems. Its top speed is a reasonable 3200 pictures a second. That slows action 200 times when you project the 16mm film at normal speed, enough in the great majority of mechanical problems to see what's going on. You don't burn up more film than you need and the instrument is simple and rugged enough for a busy man to use without trouble.

The best way for you to evaluate the Kodak High Speed Camera in terms of your own needs is to send for a booklet that not only gives you the details but quite a few case histories on how it has been used in a variety of industries. You get the booklet by writing to *Graphic Reproduction Division,*

**EASTMAN KODAK COMPANY**
**Rochester 4, N. Y.**



**the Kodak *HIGH SPEED* Camera**

Kodak
TRADE MARK

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-149

"And never forget this: It pays to use..... Columbia Tool Steel!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

USE A RED HEAD TOGGLE ACTION CLAMP

- FOR HEAVY-DUTY APPLICATION
- FOR IMPROVED APPEARANCE

RED HEAD'S *PUSH-PULL*

Has traditional RED HEAD quality features—malleable cast iron base, external head rivets, extra long barrel for greater strength and accuracy, steel-on-cast-iron for better friction surface, etc. Available in two sizes—Model PP-4 (illustrated above) with 400 lbs. recommended delivered pressure, and Model PP-8 with 800 lbs. recommended delivered pressure.

*(Write for detailed specifications, Catalog B-188)*

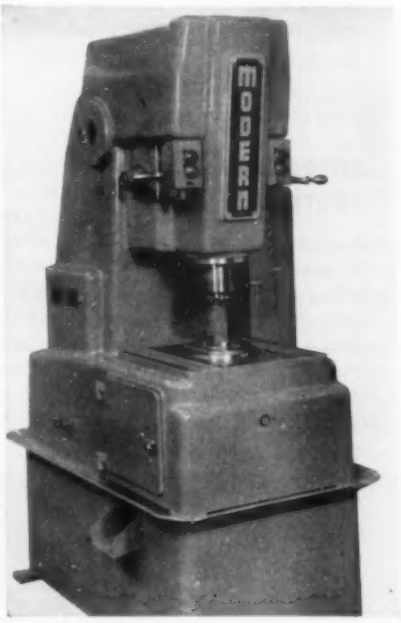
CASE-MAUL MANUFACTURING CO.
22 HARKER ST., MANSFIELD, O.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-150

## Chamfer Tool for Internal Gears

Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, Mich., offers a universal Burr-Master that deburrs and chamfers internal splines, straight-sided or involute-form helical and spur gears, ranging in size from 2 to 20-in. pitch diameter with a maximum of 4 diametral pitch. Throat clearance of the unit permits handling parts up to 22-in. OD. For high-volume production work, the machine can be supplied with automation.

Designated as the BMI-15, the machine is built to JIC standards, and




handles production quantities of internal gears or splines. A spline driver is used for gears up to 6-in. pitch diameter while a drive gear is used for larger sizes.

Prime advantage of the machine is that it chamfers both sides of the tooth and the root at one time at the rate of 5 teeth per second. In addition, it can also be used to deburr and chamfer certain types of external gears with adaptations in the tooling.

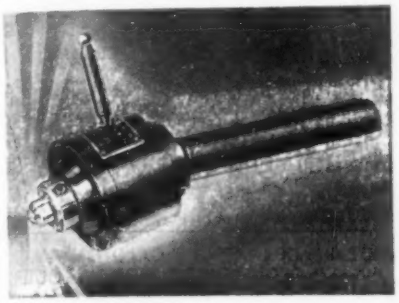
Depth of cutting stroke is infinitely variable to assure maximum operating efficiency. Shifting from one gear to another may be done quickly by changing the spline driver, workholding fixture, toolholder and form tool and—if the number of teeth change—the change gears.

Use of a three or four cutting edge, circular type form tool for deburring and chamfering insures long tool life and reduces the time required to get a sharp cutting tool in position.

**T-8-1501**

## Grinding Wheel Dresser

A mechanical rotating diamond turner for dressing grinding wheels has been developed by Wheel Dressing, Inc., 8720 W. Chicago, Detroit 4, Mich. The diamond turner, called Turnit, rotates the diamond tool at intervals to present a new sharp cutting edge of the diamond to the wheel. This rotation of the diamond tool keeps down diamond heat and pressure, keeps the facets small and sharp, and increases diamond tool life an estimated 50 percent. In



addition to longer diamond life, the increased number of facets gives better wheel finish, avoids dull glazed wheels, permits closer work tolerance and increases wheel life.

By means of a simple set screw, the tool has infinite adjustment in the range of 0 to 10½ deg to obtain from 35 to 120 facets. Both manual and automatically operated models are available; the automatic model repositions diamond for each dressing. **T-8-1511**

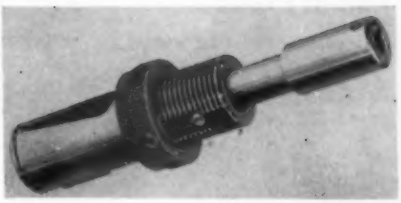
USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Tap Drivers

Seibert and Sons, Inc., Chenoa, Ill., announces the development of two improved adjustable tension and compression tap drivers for use in spindles that take adjustable adapter shank tools. Both drivers are self-adjusting, by spring action, to variation of feed between spindle and tap. The tension type is designed for use when the spindle feed is less than the feed of the tap; the compression type is used when the spindle feed is greater than the feed of the tap.

Floating holders of drivers have been designed to provide added strength and rigidity to the nose of the float. Taps are held securely in place by a trepan clamp that is tightened by a setscrew. As a safety feature, both drivers are engineered to shear the driving pin before stripping part threads or damaging spindle or holder.

Diameters of the tools are held to 0.0003 in., and total concentricity 6 in.



from the nose is held to within 0.002 in. (total indicator reading). Threads on the adapter body are ground to assure Class 2 fit with Seibert Micro nuts, which are graduated for accurate adjustment.

The tap drivers are available in shank and thread sizes from 1 to 1⅜ in.-12; shank length from 3 to 4⅝ in. Over-all lengths of the tools are 4⅝" to 6⅞ in. for tension type and 4⅞" to 7⅞ in. for compression type. **T-8-1512**

## Chrome Bath Spray Control

Control of spray can be accomplished by dropping Smoothex Anti-Fume pellets into chrome-plating baths, according to the pellet manufacturer, Smoothex, Inc., Cleveland, Ohio.

Because of an exceptionally long life, the Smoothex Anti-Fume pellets are economical to use. Dropped into a plating tank bath, they tend to keep the chromic acid in the bath by preventing the escape of fumes, spray and dragout. The pellets will not break down under normal plating operation and are so stable that once a tank is charged, the occasional addition of a few pellets will maintain reduced surface tension.

Because each pellet weighs exactly one ounce, an operator may quickly count out the proper weight charge for a given tank. **T-8-1513**


Compare design then compare price

...you'll choose GREAVES MILLS

DESIGNED FOR ACCURACY

Overarm casting is rigid, boxlike structure; dovetail planed to perfect alignment with spindle.

Spindle and intermediate shafts jig bored for accurate alignment; mounted on over-size Timken bearings.

Heavy ribbed, box type, column casting assures rigidity.

Drive—5 HP 1750 RPM motor through multiple V-belt and dependable gear train; sliding gears in column are flame-hardened, mounted on spline shafts and are flooded with oil supplied by gear pumps with built in filter.

Husky arbor support has built-in oil reservoir, adjustable bronze bushing.

All sliding surfaces hand scraped to a bearing with mating member and with master gauges.

Line boring of table and saddle together *after scraping* assures proper alignment, provides free-running lead screw.

Knee is machine jig bored for accurate alignment. All units are indicator tested during assembly to meet established alignment for milling machines.

Wide range of speed-feed combinations for every class of work. Rapid traverse speeds operation.

- Rugged Greaves Mills are accurate and dependable, yet sell for thousands of dollars less than comparable machines.
- Make your own comparison. Send for free copy of Greaves Comparison Chart.

GREAVES MACHINE TOOL CO.
2303 Eastern Avenue, Cincinnati 2, Ohio
Please send me:
☐ The Comparison Chart. ☐ Tool Lease and Deferred Payment Plans.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-151

## Saw Band

American Saw & Mfg. Co., Springfield, Mass., has developed a band saw blade with positive rake teeth called the Lenox Hook-Tooth blade for cutting nonferrous metals, wood and plastics.

The forward inclination of the positive rake teeth causes them to hook themselves into the work. This design permits greater cutting ease and allows higher cutting feeds. Rounded gullets of the blade are designed for maximum chip clearance.

Blade teeth are flame-hardened to 63-65 $R_C$ for top cutting strength. The back is 25-30 $R_C$.

Lenox Hook-Tooth band saw blades are available in ½ to 1 in. widths, from 2 to 6 teeth per in. Blades are available cut to length and welded.

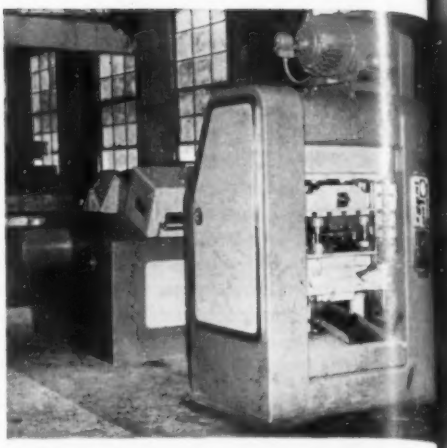
**T-8-1521**

## Punch Press

Greater operating speed is the prime objective of the press design developed by Wean Equipment Corp., Cleveland, Ohio.

With the Flying Press, it is not necessary to stop the feed of the coiled steel. It moves continuously through the press, and the dies move forward and synchronize with the strip during stamping. In this way, the number of parts produced per minute is greatly increased and accuracy improved. Production will reach as high as 600-900 strokes per minute.

The Flying Press has neither clutch nor brake. It has no conventional flywheel, but stores its energy in the motion of the dies and die holders, and applies the latent stored energy directly to the place of work. **T-8-1522**



Completed parts eject themselves from the press because of their forward movement and the suddenly reversed movement of the dies. **T-8-1522**

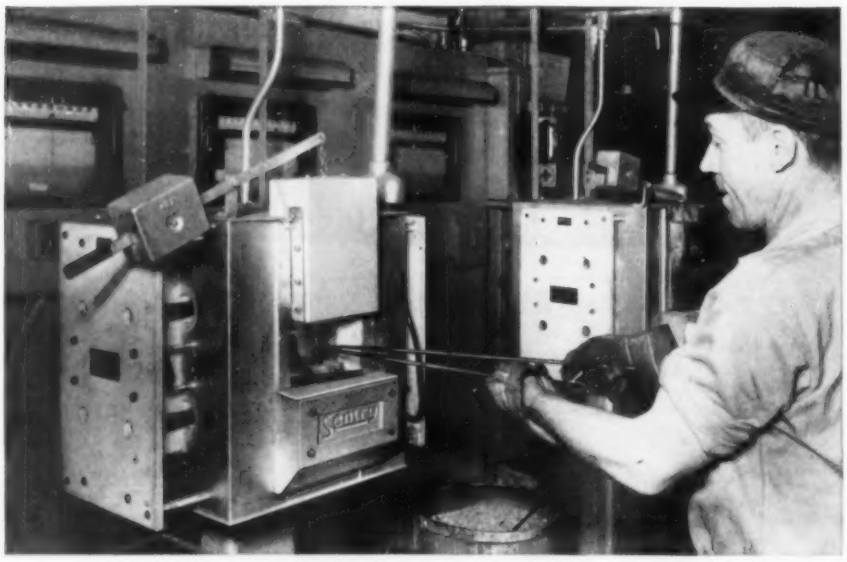
USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Automatic Feed

The Auto-Load, designed by Hi-Shear Rivet Tool Co., 8924 Bellance Ave., Los Angeles 45, Calif., automatically feeds second operation parts into a Brown & Sharpe automatic screw machine.

A screw machine equipped with this device, can feed, locate, machine and eject a wide variety of small pieces with the same fully automatic ease as bar stock. For second operation work, front and rear cross slides and six turret positions of the machine are used. With the Auto-Load still attached, the operator makes a simple change-over adjustment and the machine is ready for bar stock work.

The units are available for 0G, 00G and 2G B & S machines. **T-8-1523**

# TAFT-PEIRCE Relies on Sentry

At the Taft-Peirce Manufacturing Co. in Woonsocket, R. I., they rely on Sentry for accurate, day-after-day performance in the heat treating of such items as these thread plug gages. In addition, all types of high speed steel cutting tools are treated with complete freedom from decarburization.

If your Heat Treating Department treats *any* tools made from high speed or air hardening steels — and is troubled by surface deterioration, decarburization or scale — investigate Sentry. The Diamond Block Method of atmospheric control has been proved over and over as reliable, economical, and consistently effective.

**Request Catalog B-46**
Tells the full story of Sentry Furnaces and The Sentry Diamond Block Method.

Sentry ELECTRIC FURNACES
THE SENTRY CO. · FOXBORO · MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-152

## Edge Grinder

Edge finishing and contour grinding of all types are possible with the Kodiak Contourmatic distributed by Continental Products, Inc., Dept. ID, 3331 Superior Ave., Cleveland, O.

This self-contained, hydraulically operated unit provides fine finishes and holds tolerances within aircraft standards. Operation of grinder can be completely automatic, or semiautomatic with hand indexing. Master contour pattern is duplicated on 1 to 1 ratio by low-cost, specially developed abrasive belts that can be run wet or dry to grind either curves or straight edges to close tolerances. The Kodiak duplicating grinder can be operated efficiently by unskilled labor.

In addition to the machine, the manufacturer offers a complete tooling service, including designing and building special jigs and fixtures for specific applications. **T-8-1531**

## Tube Bending Machine

This low-cost, versatile automatic-cycle tube bending machine simultaneously forms two 180-deg hairpin bends in ferrous or nonferrous finned or plain tubing in a cycle time of less than three seconds. The compact machine, made by Walter P. Hill, Inc., 22183 Telegraph Rd., Detroit 19, Mich., has a single-tube capacity of up to 1-in. diam tubing. The center-to-center bend radius that can be formed is proportional to the tube diameter and wall thickness. Bends having legs up to 4 ft in length can be handled by the unit.

Pushbutton controls, provided for setup operations, can be used in production.

In the operation shown, two 3/8-in. diam, 0.016-in. wall thickness copper tubes are bent to form 180-deg hairpin bends and the legs are levelled before ejection. Support mandrels are pro-

MAXIMUM SAFETY AND WORK EFFICIENCY

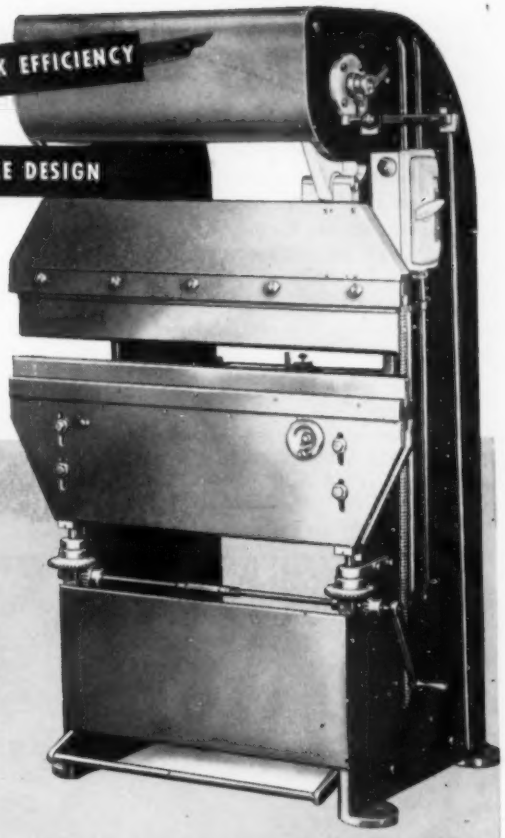
NEW CONCEPT IN PRESS BRAKE DESIGN

NEW!

di-acro

Hydraulic Press Brake with

✳STROKE CONTROL

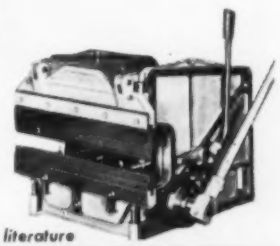


✳ *STROKE CONTROL* means that you set the most practical length of stroke for each job—60 strokes per minute at 1/4" stroke, 24 strokes per minute at 1 1/2" stroke. The cam shaft does not make a full revolution as is true with flywheel driven press brakes.

Regardless of length of stroke used, *the ram speed is always constant* to insure safe, smooth, efficient operation. No violent whipping action of material.

Twelve tons of smooth hydraulic power is applied through a mechanical cam drive which assures perfect, positive alignment of bed. Ram can be "inched" or immediately backed-off. Capacity is 16 gauge steel across 36" bed. Wide variety of standard dies in stock.

For short run or experimental work use the Di-Acro hand operated Press Brake. Eight tons of power forms 16 gauge steel across the 24" bed. Uses standard dies.



See 2 Di-Acro Exhibits at Chicago, Sept. 6-16; Production Eng. Show, BOOTH 125-126, Navy Pier. Metalworking Show, BOOTH 653, Chicago Coliseum.

di-acro PRECISION METALWORKING MACHINES

pronounced die-ack-ro

*Write for Press Brake literature*

O'NEIL-IRWIN MANUFACTURING CO.

375 8th AVENUE, LAKE CITY, MINN.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE H-8-153

vided for each tube. The machine also will handle ½, ⅝ and ¾-in. diam tubing with minor clamp and radius block changes.

Electrical controls and a built-in hydraulic pump, motor and tank unit, are housed in the unit's welded base.

Because of its hydraulic cylinder controlled wiping block, mounted on the machine base in contact with a radius bender block, this machine is able to bend light-wall tubing on small radii without flattening or lengthening, and without the use of ball mandrels.

**T-8-1541**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

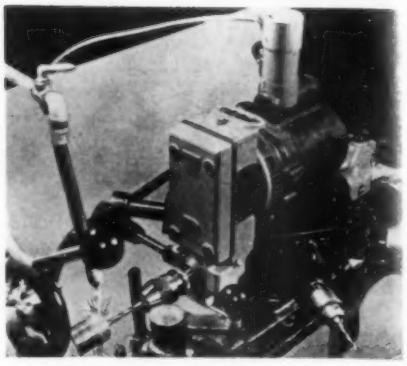
## Small Hole Drill

The Drill Speeder, a device for use on turret lathes to permit fast, accurate and economical small-hole drilling is announced by The Ward-Riddle Co., Ravenna, Ohio.

A complete, compact unit, the new Drill Speeder contra-rotates the drill at a preselected rate, enable the drill to cut at the proper surface speed. Rate of feed is adjustable.

Units mount quickly and easily to ram type turrets. A rotating electrical connector allows the turret to index freely. Ward-Riddle Drill Speeders are furnished complete with motor, rotating electrical connector, and "on-off" footswitch wired to connector and motor.

Models are available with V-belt or

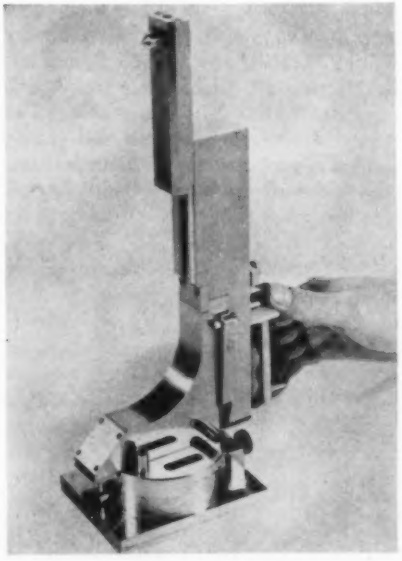


gear drives. Standard motors range from ¼ to ¾ hp, 220v, 3-phase or 110v, single-phase (550v available for Canadian users). **T-8-1542**

## Versatile Form Dresser

A diamond elevator extension model H of Fluidmotion wheel dresser is announced by J & S Tool Co., Inc., 87 122 Dorsa Ave., Livingston, N. J. With the new feature, this form dresser is fully adaptable to all types of grinders.

It may be used for form dressing all surface grinder wheels up to 24-in.



wheels. When used in this capacity, it increases the range of diamond positions, allows a wider adjustment range, and permits elevation adjustment of up to 6 in.

Without extra attachments it is adaptable for dressing internal grinding wheels including grinders such as Heald with its 10¼-in. center and Bryant with its 6-in. center.

For cylindrical grinders, the Model H will dress wheels from the smallest size up to 24-in. diameter without extra provision. **T-8-1543**

P. D. Q.
(PORTAGE DOUBLE-QUICK)

Changes from one tool to another is a matter of seconds. Three point locking feature and tapered shank assures repositioning and eliminates "run out."
Send for catalog describing individual holders and adapters or for specific information on your machine tools.

**PORTAGE Double-Quick TOOL CO.**
1054 Sweitzer Avenue • Akron 11, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-154

## Automatic Tapping Machine

A self-contained electrically controlled and operated automatic lead screw tapping machine, designed for fast, precision single and multiple spindle tapping or threading, is announced by Ettco Tool Co., Inc., 954 Johnson Ave., Brooklyn 37, N. Y. No cams, nor any air or hydraulic system are used in this unit which requires only electricity for power.

The machine, identified as A.T.U. No. 3, needs no reversing motor and can be operated at very high speeds because it utilizes a principle of forward and

reverse electromagnetic clutches. Clutch torque can be regulated over a range of from 0 to the equivalent of 2 hp. Consequently, the machine is sensitive enough to protect small taps yet has the power and torque needed to drive the larger taps. Because the clutches are energized within themselves there is no end pressure on either lead screw or taps, resulting in a thread that is as accurate as the taps or dies being used.

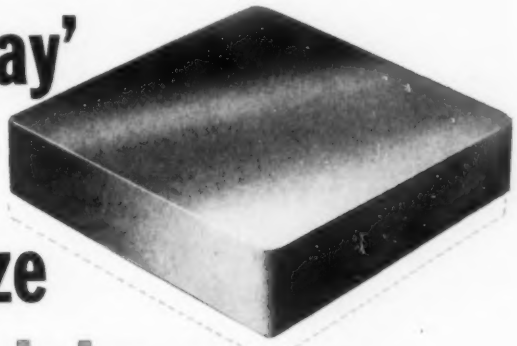
Tap depth is controlled to within ¼ turn anywhere within the maximum stroke of 1⅞ in.

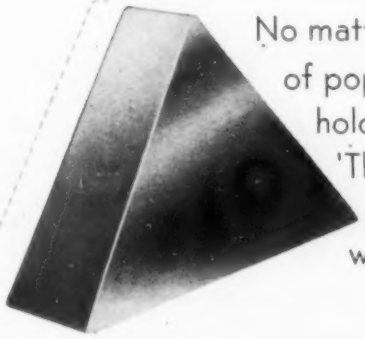
A wide choice of direct-mounted motor drives is available, including fixed speed, variable speed and variable speed geared type motors. The machine can also be supplied with single or multiple pulley drives. Tap speeds can be designed to suit the requirements.

**T-8-1551**


NOW!

for the first time...
new, lower cost
ADAMAS
'Throw-Away'
blanks
— each size
in two thicknesses



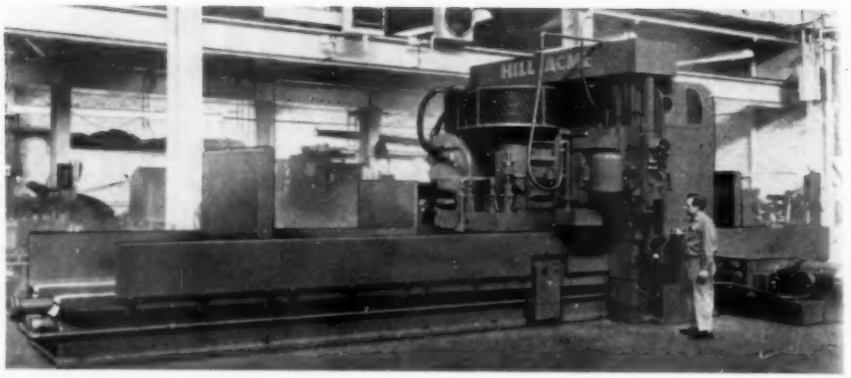


No matter what your choice of popular 'Throw-Away' blank tool holders . . . you'll find an Adamas 'Throw-Away' blank specifically engineered to fit perfectly with your tooling requirements.

Adamas 'Throw-Away' blanks are available in utility grind (top and bottom ground only) and in precision grind (ground on all surfaces for precision indexing). For more pieces between indexing — lower production costs — order Adamas 'Throw-Away' blanks in either standard or premium carbide grades. Call your local Adamas representative or write Department C2, ADAMAS CARBIDE CORPORATION, Kenilworth, New Jersey for price lists

ADAMAS CARBIDE CORPORATION • KENILWORTH, NEW JERSEY
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-155

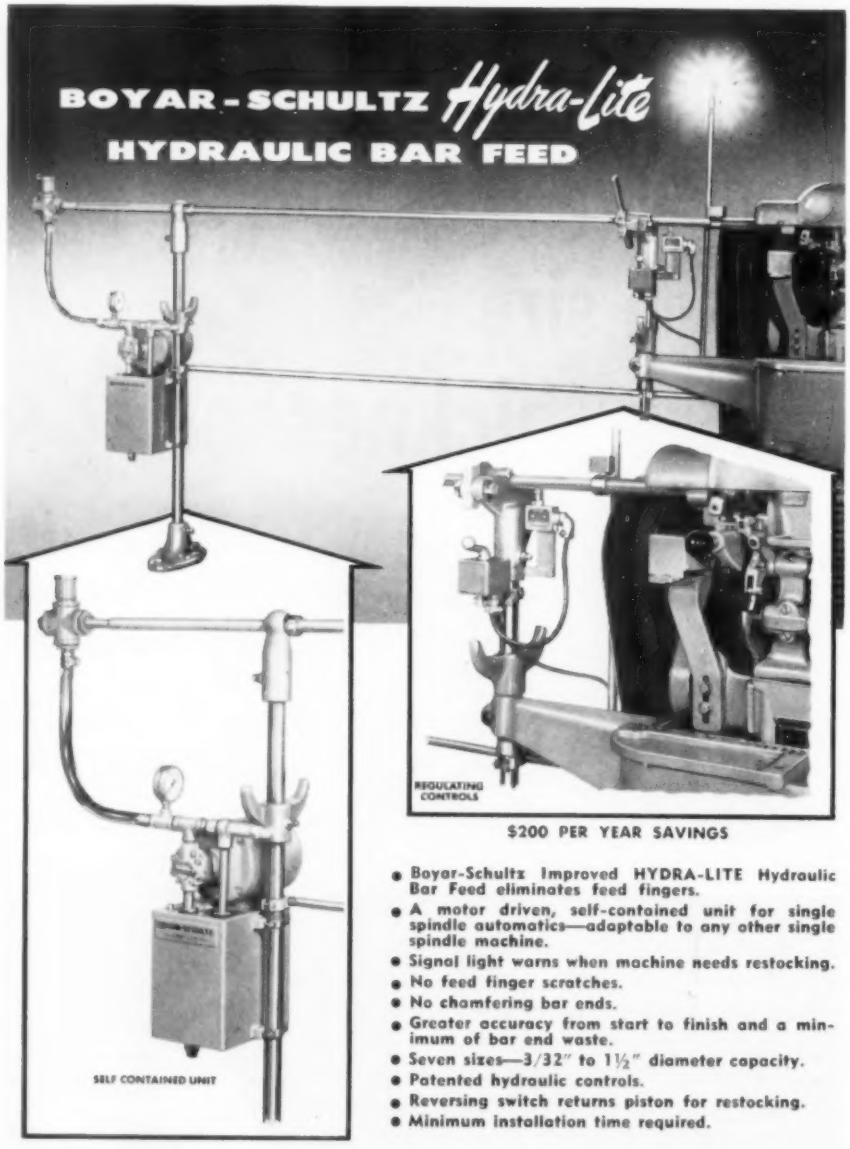
## Vertical Spindle Surface Grinder



The Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio, has completed a hydraulic reciprocating table type vertical spindle surface grinder for heavy stock removal on die blocks or steel plates up to 54 in. wide x 144 in. long. Planing operations prior to final grinding are unnecessary because finished surfaces can be ground to close tolerances on rough rolled plate or forged die blocks. A 42-in. diameter segmental grinding wheel is driven by a 125-hp TEFC V-belt main drive motor.

The wheel head travels hydraulically across the table. For certain grinding operations, an auxiliary grinding head can be moved manually or hydraulically in a horizontal direction. This auxiliary head is also equipped with manual vertical movement for fine feeding or to permit grinding of shoulders or posts with the side of the grinding wheel. This auxiliary grinding head can be provided with a 12-in. diameter (max) cup type grinding wheel for precision finish operations.

Precision feeding within 0.00025 in. is easily accomplished for either grinding head. Seven rectangular magnetic chuck units provide ample power to hold any work that must be processed. The heavy-duty vertical grinders can be furnished in 48, 60 and 72-in. table widths and in varying lengths to customer's specification. The units also are available in horizontal spindle design. **T-8-1561**


$200 PER YEAR SAVINGS

- Boyar-Schultz Improved HYDRA-LITE Hydraulic Bar Feed eliminates feed fingers.
- A motor driven, self-contained unit for single spindle automatics—adaptable to any other single spindle machine.
- Signal light warns when machine needs restocking.
- No feed finger scratches.
- No chamfering bar ends.
- Greater accuracy from start to finish and a minimum of bar end waste.
- Seven sizes—3/32" to 1½" diameter capacity.
- Patented hydraulic controls.
- Reversing switch returns piston for restocking.
- Minimum installation time required.

**BOYAR-SCHULTZ** CORPORATION Dept. D-S, 2004 SOUTH 25TH AVENUE

BROADVIEW, ILLINOIS

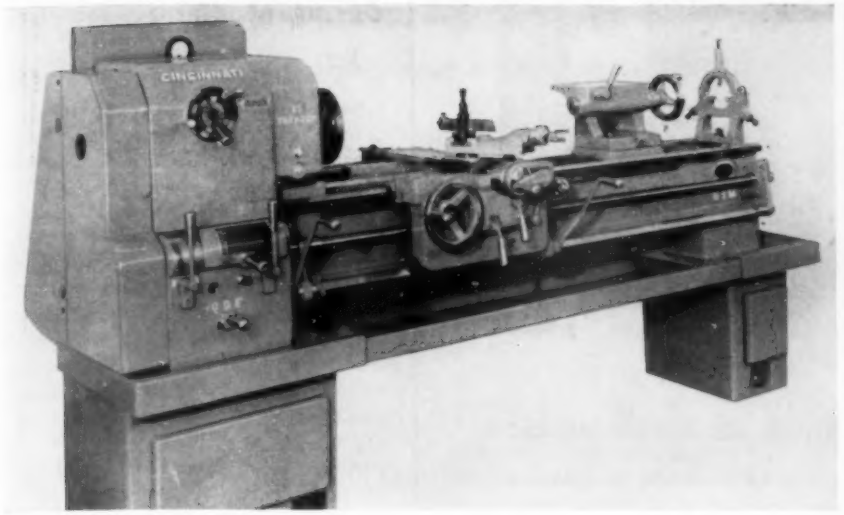
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-156


USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Speed Reducers

Line-O-Power speed reducers with capacities ranging from fractional hp to 150 hp have been announced by Foote Bros. Gear and Machine Corp., 4545 South Western Blvd., Chicago, Ill. Basic features of the new models are simplicity and compactness of design, and unusual durability of all components. Easy to maintain, they offer dependable performance, and have an unusually long work life, even with constant usage.

Input and output shafts are in a direct line to permit coupling of motor and speed reducer in less space, while the special feature is the exclusive Foote Bros. Spline Drive pinion, which makes it easy to change reduction ratios. The range of nominal ratios for double, triple and quadruple reductions is from 5.06 to 1478. **T-8-1562**



## Engine Lathes

All-geared head, Model LE Tray-Top engine lathes in 10, 12½, 15 and 18-in. sizes are announced by Cincinnati Lathe and Tool Co., Cincinnati 9, O., to provide modern, low-cost, equipment for manufacturing, maintenance and toolroom use.

Main feature of the lathes is their 12 spindle speeds in geometric progression, with a 3-lever, color-match, direct-reading shift mechanism. The spindle, with long taper key drive nose, is rigidly mounted in three precision antifriction bearings. All headstock bearings are pressure lubricated.

Forty-eight thread and feed changes are made available through a totally enclosed, automatically lubricated quick-change gearbox.

Longitudinal and cross feeds are engaged with drop levers operating positive jaw clutches, and a spindle "start-stop" control lever is supplied at the apron and quick-change box.

The lathes are offered with a 1, 1½, 2 or 3-hp motor mounted on the rear of the headstock leg for easy maintenance. **T-8-1571**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Three-Way Vise

The Universal Vise and Tool Co., Parma, Mich., announces a new and smaller version of its Universal 3-way precision Angle-Set vise, designed particularly for compound and simple angle grinding. This model #3 Universal 3-way vise, grinders model, has a 3¼-in. jaw opening with jaws 2¾ in. wide. Jaw height is 1 in. The vise is only 4¼ in. in height in the flat position and 9¾ in. high when set at the maximum angle.

It is fully adjustable in three planes with 360-deg swivel base and both cradles are adjustable to 90 deg. Base and cradles are fully graduated. The square base permits squaring against the rail of the magnetic chuck.

The cradles may be individually locked at any angle, and will remain in position under strong machining conditions.

Two larger sizes for general machining applications also are available. **T-8-1572**

## Liquid Proportioner-Dispenser

Soluble oil, chemical solutions, or other liquids may be injected into water in accurate proportions through the automatic device developed by Smith Precision Products Co., 1135 Mission St., South Pasadena, Calif. The machine, called the Smith Measure Mix, requires no outside power connection. It is so constructed that the solution being dispensed remains the same regardless of changes in water pressure or rate of water flow.

Model R-3, that has a ¾-inch pipe size, will take all water that will flow through a ¾-inch pipe line up to 10 gpm. Pressure drop through the machine is 5 to 15 psi depending on rate of water flow. A proportioner is permanently set to any proportion in the range of 1 in 25 to 1 in 200 with a standard setting of 1 to 100.

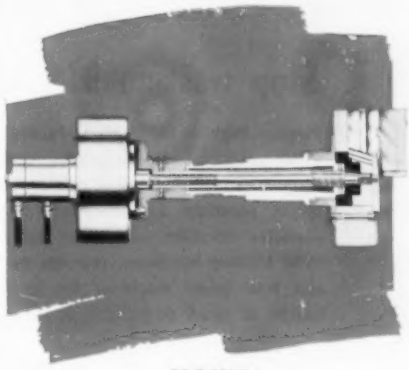
Model R-8, will take all water that will flow through a 2-inch pipe line, up to 100 gpm. Pressure drop 5 to 10 psi depending on rate of flow. Proportioner of this model is permanently set to any proportion from 1 in 100 to 1 in 500 with a standard setting of 1 in 200. **T-8-1573**


NEW

SKINNER

"JUNIOR"

POWER CHUCKING UNIT



NOW!

Maximum production speed for your small lathes TOO!

This Skinner "Junior" unit can be adapted to almost any small lathe with 1″ to 1⅜″ hole through the spindle. It is light in weight, precisely balanced to minimize spindle bearing and braking loads, and provides extreme repetitive accuracy on internal and external work.

The Skinner 8″ self-centering power chuck has gripping capacity from ¼″ to 6″. Its ¼″ jaw travel exceeds the capacity of any collet, and is particularly valuable on production work where rough or finished holding diameters may vary beyond a single collet's ability to grip.

The Skinner "Junior" unit is complete. It contains chuck, 6″ aluminum air cylinder, adapters, draw bar, etc.

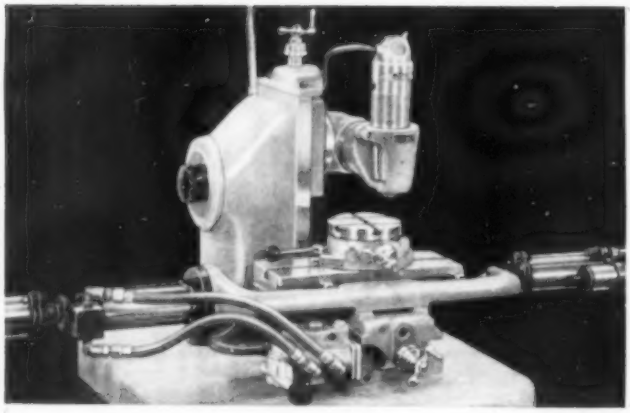
*Write Skinner or your nearest Skinner distributor for illustrated folder*

THE CREST SKINNER CHUCKS OF QUALITY

THE SKINNER CHUCK COMPANY

212 Edgewood Avenue, New Britain, Conn.

INDICATE A-8-157



SUPER 60

## Stop wasting BIG machines on small parts!

Precise High RPM Milling Machines are designed specifically for machining small parts to extremely close tolerances. Operating at 15,000 to 45,000 RPM with a full ½ H.P. motor, and accurate to .0001", they provide the speed, accuracy, and sensitivity necessary to get perfect results with small diameter abrasive wheels or tungsten carbide tools. With Precise High RPM Milling Machines, you can not only save time and tooling expense, but also free larger machines for more suitable work and greatly improve the quality of small parts!

*Attach this ad to your letterhead for FREE demonstration or literature!*

**PRECISE PRODUCTS CORPORATION**
1333 CLARK STREET, RACINE, WISCONSIN TE-8
*Quality and precision since 1882*

Precise

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-158-1


## Boring Machine

Very short runs can be made efficiently and economically, using unskilled labor, on the Unimatic precision boring machine introduced by Atlantic Instrument Corp., 90 Broadway, Norwood, Mass. Job setup has been simplified through automatic and manual controls, with timers for repetition of predetermined cycles for cutting, dwell, and reverse motion of the table and cross slide to provide uniformly precise work. On high production runs the boring cycle is unusually rapid. The machine will handle work up to 9 in. in diameter, and perform boring operations to a depth of 6 in.

Accurate boring and turning of tapers are implemented by the built-in sine bar in the headstock. Other features of the unit are an air-operated spindle brake and motorized coolant facilities.

Motor for the machine is a ½-hp, 1750 rpm, totally enclosed, sleeve bearing type. Spindle speeds are available from 775 to 4000 rpm. Total weight of the machine is only 1200 lb, and required floor space is 28 x 52 in.

**T-8-1581**


# Now Hardened Key Ways in Buck AIR CHUCKS

### New Standard Feature Added to .001" Precision Ajust-Tru Chucks

Longer wear, longer accuracy — thanks to hardened key ways — is now added to other unique features of Buck Air Chucks. *At no extra cost!*

Now, more than ever, you'll want to consider *all* of the ways the Buck can save you money.

Guaranteed .001" precision.

*Jaws machined in the tool room,* saving the down time of fitting on the chucking machines.

*Hardened jaws can be used for all operations with the Buck.*

*Accuracy adjustments made under full air pressure.*

6", 8", 10" and 12" sizes — 2 or 3 jaws — NO PRICE PREMIUM. Send for literature today.

Buck AJUST-TRU® CHUCKS

The Buck Ajust-Tru principle is unique. Jaws grip work like any other air chuck. **After work is gripped** opposed screws near the back of the chuck are used to move the chuck on the adapter to bring the work to alignment within .001".

**Buck TOOL CO.**
833 SCHIPPERS LANE
KALAMAZOO, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-158-2

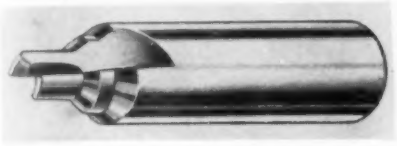
## Rotating Swivel

Designed particularly for applications in the brake and clutch field, a rotating swivel developed by Hydraulic Unit Specialties Co., Waukesha, Wis., has several advantages. It is built for high pressure and high operating speeds and is equipped with spring-loaded Teflon rings, self-centering ball thrust bearings, and highly efficient axial bearings. Compact in size—measurements are 3 x 1½ inches—this new Husco Model 4000 rotating swivel is especially suitable for use in close quarters.

**T-8-1582**

## Trepan Tools

Small, high-precision trepan cutters, available through Woodruff & Stokes Co., Inc., 353 Lincoln St., Hingham, Mass., provide the advantages of the trepanning method for small-diameter work. They reduce chip-cutting, as compared with full-area boring or drilling, permit lower requirements in driving power, and provide faster, cooler boring of shallow or deep holes with high accuracy throughout the bore at considerable savings in both tools and stock.



Offered in diameters under ¾ in., these trepan cutters are available in high-speed steel or in special alloy steels for rigid wear and accuracy requirements. Small work involving tolerances of 0.0002 in. in diameter and 0.0003 in. in concentricity, previously requiring full-area drilling and reaming or boring, can be handled in a single operation by a trepan tool. **T-8-1591**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Metal Compound and Thinner

Destiny Products Co., 2970 W. Grand Blvd., Detroit, Mich. has introduced two developments. One is an aluminum based, putty type metal filler compound trade-named "destiMetal"; the companion product is a thinner and solvent called "destinSol." The filler compound is a metal alloy in plastic form, which can be applied without heat, as a filler, to other metals, wood, plastics, fiber glass, and plaster. In its original form, it is useful as a permanent metal-filler as well as for repair of patterns, molds, dies, model, match-plates and valves. The filler can be machined and generally worked as any other metal alloy. It also can be molded to any desired shape for temporary tooling purposes.

Approximately 7 hours are required for handling cure, and 24 hours are needed before its ultimate hardness of between 6 and 10 $R_E$ in any molded shape is reached. Tested under vertical and horizontal stresses, the tensile strength of the substances is 850 psi.

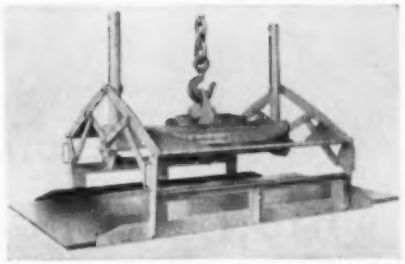
When thinned with its solvent, destinSol, the metal filler compound can be sprayed on metal, wood, plastic, fiber glass, and plaster surfaces. **T-8-1592**

## Sheet Lifter

A motorized sheet lifter with arms that move in and out in a straight line rather than in an arc has been developed by Heppenstall Co., Pittsburgh 1, Pa.

Because the arms remain vertical at all times, changing from one size sheet to another requires no manual adjustment. All operations are controlled by the craneman. After the lifter has been lowered over a lift of sheets, operation of the motor causes the arms to move in until they hold the load firmly. A self-locking brake prevents the arms from moving until the load is safely delivered.

End grabs for use with very wide or very long sheets can be added as optional equipment. In addition, a motorized rotating mechanism can be incorporated with the lifter, so that it can be turned horizontally to any direction under control of the craneman or ground crew.

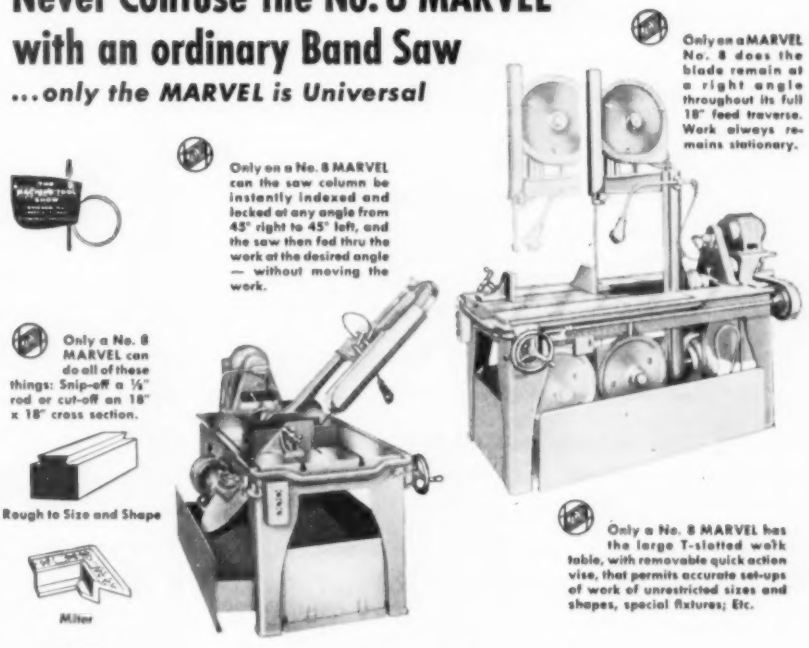


A manually operated sheet lifter that incorporates the same straight line motion and requires no manual adjustment for different-sized sheets also has been developed by Heppenstall.

Both units are available in a wide range of capacities. **T-8-1593**


**Never Confuse the No. 8 MARVEL with an ordinary Band Saw**

***...only the MARVEL is Universal***



Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.

Only a No. 8 MARVEL can do all of these things: Snip-off a ¼" rod or cut-off an 18" x 18" cross section.

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams

Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

**"Rough Machine" to size and shape with minimun chip waste**

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

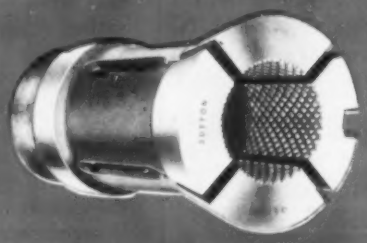
ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-159

# 3 REASONS WHY SUTTONS ARE THE BEST BUY!

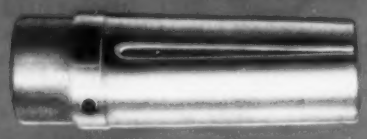
**1 Serrations**
Are the Famous DIAMOND-GRIP!

**2 Temper and Tension**
Controlled Heat Assures Absolute Uniformity!

**3 Deliveries**
Immediate Shipment From Stock on All Popular Sizes!



Standard collet for ACME-GRIDLEY, CONE, NEW BRITAIN GRIDLEY, and WARNER & SWASEY AUTOMATIC BAR MACHINES.



Style "L" master feeder with interchangeable and replaceable pads.

## COLLETS AND FEEDERS FOR ALL AUTOMATICS!

**AUTOMATIC BAR MACHINES**

STANDARD COLLETS AND FEEDERS; MASTER COLLETS AND PADS; MASTER FEEDERS AND PADS; FULL FLOAT MASTER COLLETS AND JAWS; COLLET AND FEEDER TUBES; SPOOLS AND BUSHINGS

**TURRET LATHES**

STANDARD COLLETS; MASTER COLLETS AND PADS

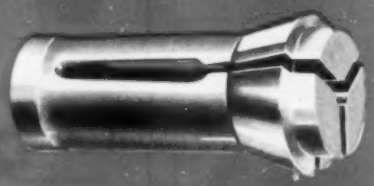
**LATHES AND MILLING MACHINES**

COLLETS FOR ALL MAKES OF LATHES AND MILLING MACHINES

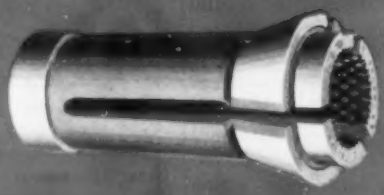
**SPECIAL**

COLLETS; TOOLS; CHUCK JAWS; WORK-HOLDING DEVICES

*Write For 28 Page Free Catalog!*

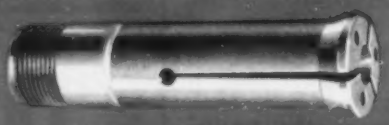


Standard collet for BROWN & SHARPE AUTOMATICS.



Standard collet for 4 and 6 spindle GREENLEE AUTOMATIC BAR MACHINES.

Super (edge-type) adjustable tension feeder. For all Automatics.



Standard collet for DAVENPORT AUTOMATIC BAR MACHINES.

## Sutton Tool Co.

**Dept. TE 8, Sturgis, Michigan**

RUNS AS TRUE AS THE SPINDLE

# Men at Work

Election of **Frank W. Rickard** as president and general manager of Mechanics Universal Joint Div. of Borg-Warner Corp. was made public recently. Since May of 1953 Mr. Rickard has been director of manufacturing services of Borg-Warner.

Simultaneously **Chester E. Palmer,** former vice-president and assistant general manager of the Mechanics division, was elevated to the post of executive vice-president.

Another division of Borg-Warner Corp., the Borg & Beck Div., has elected **Harold Nutt** as its president. Previously vice-president and general manager, he now succeeds **T. L. Knecht** who retired.

Two other major executive promotions at Borg & Beck involved **Clyde Bissell,** who has assumed the post of vice-president while continuing to serve as secretary, treasurer and controller; and **Edward H. Lipke,** factory manager, who now also has the title of vice-president of the division.

Promotion of **Arthur B. Warner** to the post of chief engineer has been announced by Minnesota Rubber and Gasket Co. This is the second advancement for Mr. Warner in the past eight months; he was made factory superintendent last October.

At the election of officers which made Marvin R. Anderson president of the American Gear Manufacturers Assn., **Fred R. Eberhardt** was made vice-president of the association, and **G. E. Gunderson** was elected treasurer. Mr. Eberhardt is president of Eberhardt-Denver Co., and Mr. Gunderson is president of Brad Foote Gear Works, Inc.

Two executive appointments have been announced by Aro Equipment Corp. **Marquard J. Anderson** has been named a vice-president of the firm. Associated with the company since 1945, he has been assistant to the president for the past three years.

**J. R. Markey,** who has been assistant to the vice-president of Aro since 1952, was elected a director of the corporation.

**Thomas E. Williams** has been appointed general superintendent of Joseph T. Ryerson & Son, Inc. West Coast plants of a staff basis. This appointment is in addition to his present duties as superintendent of the company's Los Angeles steel service plant.

**Robert G. Emrick** is new president of Ettco Tool Co., Inc. Prior to his election to succeed Melvin H. Emrick, he was executive vice-president of the company.

Appointment of **M. C. Hutto** as general manager has been made public by the Maxwell Co. At the same time announcement was made that effective immediately, Hutto adjustable bore-gages will be made and sold by Maxwell.

Also announced by the company was the appointment of **Elmer J. Kalat** as chief engineer. A veteran of 10 years, Mr. Kalat will have charge of all engineering functions and research and development of all new products.

**Renald F. Zemke,** former manager of the process engineering department, has been named works manager of the standard machine division of Kearney & Trecker Corp.

At the same time the company announced the appointment of **John P. Bunce,** supervisor of processing, standards and production control of the special machinery division, to the post of staff assistant to the manufacturing vice-president.

Four managers have been promoted to positions as vice-presidents in charge of their respective divisions at Fischer & Porter Co. Those named were **Robert A. Stern** of the Data Reduction & Automation Div.; **Louis H. Aricson** of the International Div.; **Nathaniel Brewer** of Research, and **Edward J. Querner** of Manufacturing.

**Melvin H. Emrick, former president of Ettco Tool Co. now is chairman of the company's board of directors. Mr. Emrick is a member of the Greater New York chapter of ASTE.**

**Henry H. Lentzner is executive vice-president in charge of manufacturing at Kearney & Trecker Corp. He previously was manager of the firm's special machinery division.**

**Marvin R. Anderson, executive vice-president of Michigan Tool Co., has been elected president of the American Gear Manufacturers Assn. He also is a member of ASTE'S Detroit chapter.**

**Milton E. Berglund has been elected executive vice-president of The Torrington Co. A veteran of 38 years with the company, he was vice-president of manufacturing since 1946.**

Board of directors of The Bullard Co. have approved the appointment of **Frank U. Hayes** as assistant general manager of the company. Mr. Hayes, who is a vice-president of Bullard, has been sales manager since 1947. Succeeding him in that post is **H. Edward Neale** who formerly was assistant sales manager.

**Frank F. Elliott** has been made new president of Crane Co. of Chicago. Crane is this year celebrating its centennial anniversary in the industry.

New general manager named by Wagner Brothers Equipment Co. is **Steve Jerome.** He brings to his new post several decades of diversified experience in engineering, production and management of plant operation.

**C. Herbert Quick** has been appointed assistant to the director of research and development of Norton Co. Mr. Quick, who joined Norton in 1924, has been chief inspector and engineer of ceramic development.

IF YOU ARE A MAN THAT
WORKS THE ANGLES . . .
HERE'S A NEW SLANT ON
FAST ANGULAR SET-UPS
THE MAGNA-SINE
OMER E. Robbins CO.
24808 PLYMOUTH RD. • DETROIT 39, MICH.
ALSO PRODUCERS OF SPECIAL MACHINERY, GAUGES AND FIXTURES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-162


**William J. Millett** has been named assistant vice-president in charge of manufacturing of Worthington Corp.'s Air Conditioning and Refrigeration Div. Associated with Worthington for the past 42 years, Mr. Millett most recently served as works manager at the Holyoke Plant.

Earlier, Worthington announced the appointments of **Hellmuth Walter** as director of research for the corporation, and of **Robert S. Sherwood** as assistant director of research.

New chief engineer for Vickers Electric Div. of Vickers Inc. is **L. W. Buechler,** former manager of control product sales for the division.

**Theophil H. Mueller,** assistant to the president of The Torrington Co., has also been elected a director of the company.

As of July 1, **William P. Drake** becomes president of the Pennsylvania Salt Mfg. Co. succeeding **George B. Beitzel.** Mr. Drake, who has 21 years' service with the company, has been its executive vice-president since last February. Mr. Beitzel who has been the firm's chief executive since 1949, will continue his association with the company as a member of its board and as chairman of the board of the Pennsalt International Corp., a subsidiary.

**Arthur E. Darcy** is now manager of the machine methods department of the Coated Abrasives Div. of The Carborundum Co.

**Ben H. Carlisle** has been named manager of the recently established New Products Div. of Clark Controller Co. Previously, Mr. Carlisle served in the applied engineering department.

Carboloy Dept. of General Electric Co. has named **Frank M. Mansfield III** as manager of product planning and market research. Prior to this appointment he was manager of product programming.

The National Society of Professional Engineers elected **Allison C. Neff,** vice-president of Armco Drainage & Metal Products, Inc., as society president for the coming year.

At its recent annual meeting, The Society of the Plastics Industry elected **Norman Anderson** president for the coming year. Mr. Anderson is president of General Molded Products, Inc. Other officers elected at the meeting were **Alan S. Cole,** executive vice-president of Breskin Publications, Inc., as vice-president, and **William C. Bird,** president of Prolon Plastics, Pro-phy-lac-tic Brush Co., as secretary-treasurer.

# Trade Literature

**For Free Booklets and Catalogs—Convenient Request Card on Page 169**

### Cold Roll Forming

Extensively illustrated, 88-page revised manual covers process for cold roll forming and equipment involved; discusses tooling required, details of special operations, and describes end uses of its products, their advantages and applications. The Yoder Co., 5500 Walworth Ave., Cleveland 2, Ohio. **L-8-1**

### Milling Machines

Fourteen-page catalog describes company's high precision, universal, vertical and plain milling machines; each model illustrated and described as to special features, advantages and operation; includes specifications. Marac Machinery Corp., 45 S. Broadway, Yonkers, N.Y. **L-8-2**

### Investment Casting Furnaces

Bulletin SC-170, "Gas Fired Furnaces for Investment Casting," explains how company's gas-fired furnaces provide uniform mold heating, accurate time-temperature cycles and simple burner control; outlines advantageous characteristics and special features of line; also included is a chart of "Characteristics of Typical Investment Casting Alloys," with product and application photos. Adv. Dept., Surface Combustion Corp., Toledo 1, Ohio. **L-8-3**

### Presses

Design and construction features of company's Series E single acting, open back, power bench presses presented in 12-page illustrated booklet No. 770-M-4; variety of work samples illustrate various applications of the line; comprehensive specification table shows dimensions and other data for three sizes of low pattern and three sizes of high pattern machines; dimensional drawings related to the table give complete measurements of details. Waterbury Farrel Foundry and Machine Co., Waterbury, Conn. **L-8-4**

### Automation

Illustrated 20-page brochure "Opportunities Through Automation," shows in graphic form typical examples of standard, transfer and special machines equipped with mechanisms for automatic loading and unloading of workpieces; stresses benefits to medium and small companies. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. **L-8-5**

### Investment Castings

Sixteen-page booklet describes "Crucible Accumet® Precision Investment Castings", and outlining their principal advantages; three tables list composition and properties of carbon, low alloy, stainless, high temperature alloy, and tool steel precision castings and the magnetic properties of the three most frequently supplied Alnico magnets. Adv. Dept., Crucible Steel Co. of America, P.O. Box 88, Pittsburgh, Pa. **L-8-6**

### Machine Components

Extensively illustrated 20-page brochure covers complete line of standardized machine components including hydraulic drill units, automatic cam feed drilling units, lead screw tapping units, multiple spindle heads, automatic index tables and machine bases; points out special features of each and gives specifications and dimensions. The Hartford Special Machinery Co., 280 Homestead Ave., Hartford, Conn. **L-8-7**


***Try these lightweight...speedy***

PORTABLE TOOLS

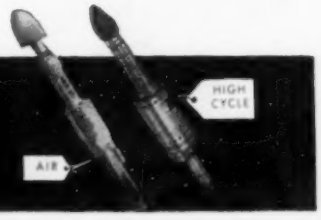
- Produced in the industry's most modern, air-conditioned plant to give you *top precision.*
- Gives you advanced features for *faster production, easier handling.*
- Backed by Rotor Tool's 25-year reputation for applying the *right tool for your job.*

*Ask for a demonstration of any of these tools.*

*See how they can cut your costs!*

Special bulletins on all tools on request.

THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

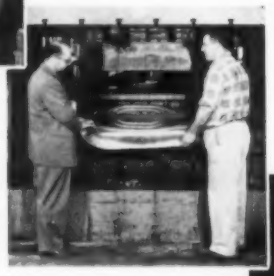



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-163

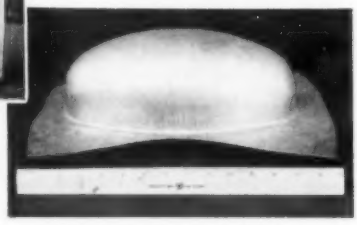
GOODYEAR AIRCRAFT

*Slashes*
TOOLING COSTS
*by 50 to 75%*
with
HYSOL 6000
Series
EPOXIDE
RESINS

Cast spinning chuck for spinning aluminum.

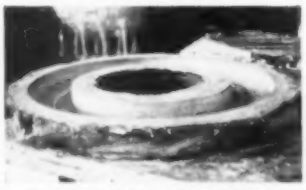


.051" thick 51S type aluminum being formed on plastic die which was cast.



.051" thick stainless steel part drawn on plastic die.

Cast plastic hand-forming assembly block.



Plaster mold used for casting of plastic.

Tool being cast into plaster mold.

Material and fabrication time are the major considerations in tooling costs. Goodyear saves 50 to 75% with HYSOL 6000 Series tooling plastics! Here's how: . . . Per volume costs are cheaper than metal. Fabrication time and expense are also cut . . . tools are produced faster and with no increase in personnel or capital investment. A plastic die can be cast or laid up directly from master die models without hand barbering or fitting, requiring little skilled labor and no expensive machinery. Time is slashed, and a tool can be completed and in use within a few days. HYSOL produces more tools per dollar than any other method and eliminates large stocks of various sizes of steel and all metal waste.

Plastic tooling may solve your problems. HYSOL plastics are useful in a variety of molding, casting, laminating, and allied applications. Our research, design, and production departments are ready to serve you. Write, wire or phone.

PROGRESSIVE PRODUCTS THRU CHEMICAL RESEARCH
HYSOL
Product of HOUGHTON LABORATORIES, INC.

houghton laboratories, inc.

115 BUSH ST. OLEAN, NEW YORK

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-164

### Carbides

Company's complete product line of carbide tooling, blanks and inserts described in catalog No. 55; includes details on latest general purpose steel cutting grade K21 as well as introducing new K11; outlines features of each category and recommended application. Kennametal, Inc., Latrobe, Pa. **L-8-8**

### Brass Forging Terms

Four-page dictionary-type folder defines meaning of terms commonly used in connection with brass forgings. Copper & Brass Research Assn., 420 Lexington Ave., New York 17, N.Y. **L-8-9**

### Dial Indicators

Four-page illustrated bulletin No. 455 describes "Em-re" dial indicators for all uses from production inspection to laboratory measurements. Outlines construction features and advantages; includes specifications. Petz-Emery Inc., Pleasant Valley, N. Y. **L-8-10**

### Surface Measurement

Twelve-page illustrated catalog describes Profilometer equipment for shop measurement of surface roughness; introductory text discusses use of equipment and shows combinations of equipment most commonly used. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich. **L-8-11**

### Feed-Speed Calculator

Slide-type calculator gives quick answers to carbide tool users' questions on recommended feeds and speeds; includes tungsten carbide grade selection scale for ferrous and nonferrous materials, hardness conversion chart, horsepower correction factor scale and tungsten carbide manufacturers grade comparison chart. Willey's Carbide Tool Co., 1340 W. Vernor Hwy, Detroit 1, Mich. **L-8-12**

### Die Springs

Sixteen-page illustrated catalog shows complete line of die springs; offers simplified method of spring selection for choosing correct size and capacity spring for specific operation; Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. **L-8-13**

### Controls

Bulletin S-10 describes in detail scope of company's services in phases of design, purchasing, construction and start-up of packaged automatic control systems; case histories point out various applications; illustrated. Automatic Temperature Control Co., Inc., 5200 Pulaski Ave., Philadelphia 44. **L-8-14**

### ears

Twenty-four page illustrated catalog sents in inventory style company's ilities production for mass produc- n of gears for high-precision applica- ns as well as regular industrial uses. oote Bros. Gear and Machine Corp., 45 S. Western Blvd., Chicago 9, Ill. **L-8-15**

### D-C Welder

Complete details on Controlarc mag- etic amplifier rectifier d-c welder cov- red in 4-page bulletin; includes con- truction and operation features, ad- antages, performance charts, electrical specifications data. Vickers Electric Div., 1815 Locust St., St. Louis 3, Mo. **L-8-16**

### Hydraulic Presses

Illustrated bulletin No. 1036-B describes Hydrolairs®, small hydraulic production presses powered by compressed air; includes specifications, dimensional and operational data, tonnage capacities, etc. Elmes Engineering Div., American Steel Foundries, Cincinnati 29, Ohio. **L-8-17**

### Machining Titanium

Recommendations for machining titanium and titanium alloys presented in 8-page brochure; suggestions are based on basic machining data culled from fabrication experience and research studies. The Mallory-Sharon Titanium Corp., Niles, Ohio. **L-8-18**

### Stub Taps

Complete stub tap standards recently developed by NSMPA, plus detailed specifications and design data of company's line of taps manufactured according to these standards presented in 4-page booklet; illustrated with photographs, engineering drawings and charts. Besly-Welles Corp., 100 Dearborn Ave., Beloit, Wis. **L-8-19**

### Welding Machines

Comprehensive 54-page catalog describes company's variety of welding machines, automation machines and special machine tools. Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich. **L-8-20**

### Hydraulic Transmission

Catalog Section T-100 presents details of company's new variable speed hydraulic transmission; covers design and construction features and applications; includes performance chart and engineering drawings. Gerotor May Corp., Box 86, Baltimore, Md. **L-8-21**

### Measuring Tools

Complete line of mechanics hand measuring tools and precision instruments and equipment, including 85 new tools not heretofore listed, presented in Catalog No. 27; each tool described in detail and pictured includes instructions for using the tools and describes and illustrates typical applications; also contains reference section of tables and pertinent information for mechanics, machinists and other tool users. The L. S. Starrett Co., Athol, Mass. **L-8-22**

### Steel Terminology

Thirty-two page dictionary-brochure, "Simplified Steel Terms and Engineering Data", defines more than 180 terms used in purchase, manufacture, treating, machining and finishing of steel; further amplified by photos, charts and tables to explain various subjects such as standard grain sizes for steel, approximate hardness conversion number for steel based on Brinell, method of determining hardenability, etc. LaSalle Steel Co., Chicago 80, Ill. **L-8-23**

—or, if you prefer, let us tell you the whole story right now—the story of how you can produce more gears and better gears—more splines and better splines—in less time—at lower cost.

Gear-O-Mation* will be shown in operation at the Machine Tool Show. All units are now in production and have been production-tested.

*Trademark

MICHIGAN TOOL Company

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.
IN CANADA: COLONIAL TOOL CO., LTD.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-165

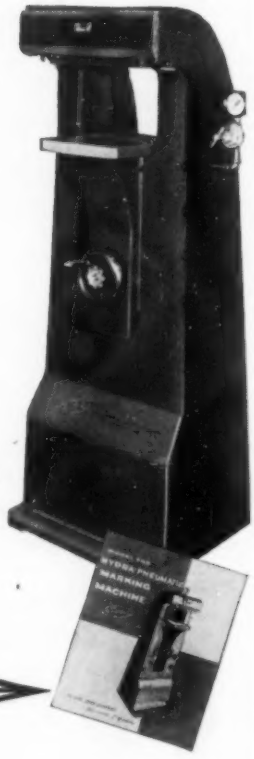
Now... MARKING BECOMES
A PRODUCTION LINE OPERATION
WITH MARKING MACHINES
by Parker

MARK UP TO
1000 PIECES PER
HOUR WITH
ACCURACY...
UNIFORMITY...
and SPEED!

HYDRAULIC
#650
MARKING MACHINE

Send for Literature





HYDRA-PNEUMATIC
#700
MARKING MACHINE

Fully automatic, the #650 and #700 Marking Machines are used for production marking round or flat surfaces.

Send for Literature

Standard or custom tooling for any marking application can be shipped from stock or designed and built to specification.

Send for Literature today!

THE
PARKER
STAMP WORKS, INC.
by Parker
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-166

# abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

## Ultrasonic Techniques in Industrial Cleaning

Development of ultrasonic techniques in industrial cleaning is discussed by S. Spizig in the May 1955 issue of *Werkstatt und Betrieb*. He describes in detail European instrumentation and machinery. High frequency vibrations are produced to agitate the cleaning fluid up to several hundred thousand vibrations per second. At 12½ hp per sq. ft. and a frequency of 800,000 vibrations per second, the acceleration in water corresponds to 200,000 times the acceleration due to gravity. Thus the adhesive force between workpiece and dirt particles is destroyed and the workpiece is cleaned.

Various methods of producing the vibrations are described in the article—they are transformed from electrical into mechanical oscillations using either mica-vibrators or magnetical or barium-titanat vibrators. The first one is recommended for frequencies between 500,000 and 10,000,000 cycles per second, the second for frequencies from 10,000 to 100,000 cycles per second and the third for frequencies from 100,000 to 500,000 cycles per second.

The vibratory resistance of the cleaning fluid must also be taken into consideration for effective cleaning, affecting the efficiency by as much as 100 percent according to data given in a table of the article. The author indicates that ultrasonic cleaning is already being used for cleaning small items such as gears for watches and the ears of needles. It was necessary to clean every ear individually prior to the introduction of ultrasonic cleaning with which 1000 needles can be cleaned within ten minutes. Optical lenses can be cleaned within 30 seconds as well as entire subassemblies. He cites as an example an instance in which 16 hydraulic valve stems of an 8 cycle motorhead were cleaned, all assembled. Numerous other examples are given in the paper, which is well illustrated.

### Grinding Carbide Tools with $CO_2$ Coolant

Grinding time could be reduced about 1 percent and wheel wear 33 percent by using $CO_2$ as a coolant, according to tests made by G. Baumgart, reported by him in an article in issue number 7 1955 of *Werkstatt und Betrieb*. The author indicates, however, that from a cost standpoint grinding with $CO_2$ is about 25 percent more expensive than with conventional cutting fluids.

Among the advantages of $CO_2$ coolants the author points to the absence of grinding cracks even with heavy grinding cuts. He indicates that the workpieces remained cool or heated only slightly. The grinding wheel is always visible to the operator due to the fact that grinding dust is removed by $CO_2$. It is, however, necessary to produce $CO_2$ "snow" at the grinding wheel in order to obtain these benefits, which depend on the pressure and the size of the orifice. The orifice should not be less than 0.008 inch diameter in order to prevent formation of ice which would clog the orifice.

### Electron Microscope

Another article on the application of the electron microscope to workshop problems appeared in the issue of June 1955 of *Werkstattstechnik und Maschinenbau* authored by E. Brueche. The first part of the investigation has been previously discussed in the June 1955 issue of THE TOOL ENGINEER, page 188.

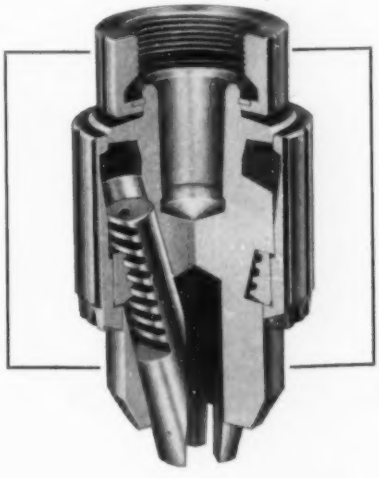
The author reports on an investigation concerned with what happens at the surface of a main spindle of a lathe during and after the run-in period. The spindle of about 2-inch diameter was run at the maximum speed of the lathe, namely 3600 rpm, and at lower speeds of 2160 rpm using bronze bushings. Clearance between bushing and spindle was 0.0004 inch; lubricant was gasoline. More than 100 investigations of the wear of the surface were made with the electron microscope at various intervals ranging from 1 to 100 hours. It was found that the surface was plastically deformed and that small irregularities were gradually smoothened as the wearing progressed. The surface of the bronze bushing is also constantly subjected to changes and the softer surface of the bushing was found to be able to bring the hardened surface of the spindle into plastic flow.

Other investigations with the electron microscope were concerned with roughness tests on glass, aluminum and other materials and with investigations of grinding wheel scratches on the surface produced.

*It* **holds fast** *at both ends*

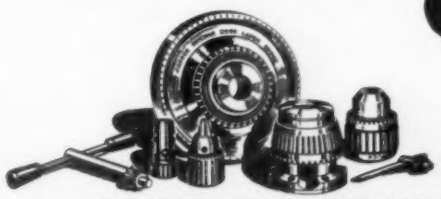
The threaded collar on this Jacobs Chuck provides a positive lock between chuck and drill press spindle. Here's a chuck that won't let go on either end, however you use it.

The locking grip on the spindle end is more than matched by a holding grip of tremendous power on the business end. And, like all Jacobs Plain Bearing Chucks, this one is capable of greater accuracy and longer precision service than any comparable chuck made today.



Jacobs Chucks for every tool and work holding need are as near as your industrial distributor. Call him for prompt, experienced service, or write The Jacobs Manufacturing Co., 2008 Jacobs Road, West Hartford, Conn. Ask for Catalog 100.

**JACOBS AND YOUR LOCAL DISTRIBUTOR**
are ready to deliver the chucks you need and the service you deserve.
***first in chucks . . . first in service***



**Jacobs**
**CHUCKS**
**If it's a Jacobs–it holds**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-167

**NILSON 4-SLIDE TAKES A TOUGH ONE . . .**

Mass production of body trim clips for a leading make automobile proved a complex forming problem. A. H. Nilson's 4-Slide (Model S-4-T) did the job, forming .025" x 3", 1065 C.R.A. steel at 54 strokes per minute! Accurate, fast, and automatic, Nilson 4-Slides keep pace with one of the nation's biggest industries.

**THIS ONE WAS EASY . . .**

A Nilson 4-Slide, Number 1, forms 150 drapery hooks per minute from 0.70 basic steel wire. Nilson 4-Slides form wire or ribbon stock from the coil. They straighten, feed, pierce, blank, swage, stamp or coin, cut and form in one, fast, automatic operation . . . accommodate wire up to .5" dia., in feeds to 32" max., and ribbon up to 3.5" wide. Press sections from 5 to 75 tons.

A. H. Nilson provides forming recommendations from detailed information without obligation. Send for catalog.

A.H. NILSON MACHINE COMPANY

1520 RAILROAD AVENUE, BRIDGEPORT 5, CONNECTICUT

Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses
Wire & Ribbon Stock Forming Machines
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-168

## Analysis of the Lapping Process

Lapping is characterized by the loose abrasive used between the lap and the work. The absence of the positive drive used in grinding renders it possible to machine without producing stresses in the work according to an article in issues number 4 and 6, 1955 of *Werkstattstechnik und Maschinenbau*, published by H. Lichtenberger.

It had been found in lapping disks that the metal removal was substantially affected by the amount of the lapping compound regularly added during the operation but that a reduction in the abrasive often resulted in faster metal removal, contrary to expectation and shop practice. It was therefore decided to investigate the various aspects of lapping operations on a more scientific basis than before, paying particular attention to the relationship between metal removal, surface finish, composition and amount of abrasive used in the lapping operation.

The author reports that true chips are produced in lapping operations unless the grit exceeds number 1000. Above this it is held that the lapping process is limited to plastic deformation of the surface without chip formation. In this region the action of hydrostatic pressure and friction becomes more pronounced.

After an analysis of the lapping process the author discusses the instruments and materials used in his tests. The latter include cast iron and two types of steel. He used 5 different brands of lapping compounds and found that optimum conditions for metal removal were obtained where 100,000 grits were active per square centimeter of surface. The metal removal dropped rapidly when the number of grits was reduced to 16,000 grits per sq. cm. and also when it was increased to 1,000,000 grits per sq. cm. The drop in metal removal was 30 percent and 15 percent respectively.

The author introduces the concept of tool life for the abrasive and defines it as the time required until the compound film breaks. His tests revealed that a similar relationship exists between tool life and the ratio of the overlapping surfaces as that between tool life and chip cross sectional area in turning operations, although to a different extent apparently. Thus tool life drops rapidly as the ratio of the overlapping surfaces increases. He indicates furthermore that the metal removal factor, amount of metal removed per unit time, is lower when lapping cast iron than when lapping steel.

Vibration enters the lapping process also, causing variation, in the metal removal factor and breakage of the abrasive film.

# THE TOOL ENGINEER'S *Service Bureau*

## TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-8-196-2 | Ace Drill Bushing Co., Inc. | **Drill Bushings**—Catalog G discusses Ace's complete line of drill bushings. (Page 196) |
| A-8-226 | Allegheny Ludlum Steel Corp., Carmet Division | **Die Steels**—32-page catalog contains data on all grades, blanks, tools, die sections, punches, draw die inserts, etc., manufactured by Allegheny Ludlum. (Page 226) |
| A-8-13 | American Drill Bushing Co. | **Drill Bushings**—New catalog W-4 discusses the varieties and advantages of American Bushings. (Page 13) |
| A-8-14 | The American Tool Works Co. | **Duplicating Lathes**—How manufacturing time is decreased is discussed in bulletin 35. (Page 14) |
| A-8-144 | B. C. Ames Co. | **Dial Indicators**—Catalog describes complete line of Ames' indicators. (Page 144) |
| A-8-178-1 | Anocut Engineering Co. | **Electrolytic Shaping**—"The New Electrolytic Shaping Method" describes the advantages of the process. (Page 178) |
| A-8-44 | The Atrax Co. | **Carbide Tools**—88-page catalog for Atrax Tools includes selection tables and recommended applications. (Page 44) |
| A-8-227 | The Bellows Co. | **Pneumatic Devices**—Bulletin CL-50 describes Bellows devices and tells how they are used. (Page 227) |
| A-8-142 | Edward Blake Co., Inc. | **Tap Grinders**—Two catalogs are available which discuss "Tapsaver" grinders. (Page 142) |
| A-8-232 | The Blanchard Machine Co. | **Surface Grinders**—Work accomplished on Blanchard grinders is discussed in Catalog 18-C. (Page 232) |
| A-8-223 | Campbell Machine Division, American Chain & Cable Co. | **Abrasive Cutters**—"Principles of Abrasive Cutting" describes the money-saving features possible with Campbell Cutters. (Page 223) |
| A-8-51 | Carboloy, Dept. of General Electric | **Carbide-Equipped Dies**—Carboloy Die Engineering Manual D-124 is available on request. Complete details on Carboloy Die Training School are also available. (Page 51) |
| A-8-150-2 | Case-Maul Manufacturing Co. | **Toggle Clamps**—Catalog B-122 describes the versatility and wide-range of sizes of Red Head Toggle Action Clamps. (Page 150) |
| A-8-49 | Chicago Pneumatic Tool Company | **Pneumatic Hand Tools**—Booklet SP-3164 "Magnamatic Case Histories" available on request. (Pages 48-49) |
| A-8-35 | Cincinnati Shaper Co. | **Press Brakes**—Catalog B-4 describes Cincinnati Interlocking all-steel construction, centerline loading, deep rigid beds and rams. (Pages 34-35) |
| A-8-140 | Clearing Machine Corp., Division of U. S. Industries, Inc. | **Straightening Presses**—Folder contains specifications for Clearing straightening presses. (Page 140) |
| A-8-23 | Colonial Broach & Machine Co. | **Broaching Machines**—Complete information on the Colonial One-Way surface broacher contained in Bulletin VC-55. (Page 23) |
| A-8-59 | Cone Automatic Machine Co., Inc. | **Automatics**—Experimental service for multiple-spindle automatics is described in "Four Steps With Cone". (Page 59) |
| A-8-197 | Consolidated Machine Tool Corp., Modern Tool Works Division | **Collapsible Tap**—The complete story of MC Collapsible Tap is discussed in Bulletin M-113. (Page 197) |
| A-8-194 | Crane Packing Co. | **Lapping Machines**—Possibilities for production lapping are contained in illustrated booklet. (Page 194) |
| A-8-184-1 | The Eastern Machine Screw Corp. | **Insert Chasers**—"Selecting the Proper Die Head for the Job" is available on request. (Page 184) |
| A-8-149 | Eastman Kodak Co., Graphic Reproduction Division | **High Speed Camera**—Details and case histories concerning high speed cameras are described in booklet. (Page 149) |
| A-8-IBC | Ex-Cell-O Corp. | **Boring Machines**—All the facts concerning precision boring machines are given in catalog. (Inside Back Cover) |
| A-8-57 | Frauenthal Division, The Kaydon Engineering Corp. | **Grinding Machine Heads**—Complete details on Frauenthal 1800 series double head grinders are contained in catalog. (Pages 56-57) |

**USE THIS HANDY FORM** ➡

to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

855 *THE TOOL ENGINEER, DETROIT 38, MICH.*

READER SERVICE CARD

Please send me further information as indicated below:

(Mark Key Number of trade literature, tools or advertisements)

| ADVERTISERS | TRADE LITERATURE | TOOLS OF TODAY |
|---|---|---|
| A— | L— | T— |
| A— | L— | T— |
| A— | L— | T— |
| A— | L— | T— |

NAME _____ POSITION _____

FIRM _____ BUSINESS _____

Please Check One ☐ Firm Address ☐ Home Address } STREET _____

CITY _____ ZONE NO. _____ STATE _____

# THE TOOL ENGINEER'S *Service Bureau*

## TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-8-5 | Hardinge Brothers, Inc. | **Second Operation Machines**—Illustrated Bulletin DSM59 discusses the variable speed machines for production departments and explains their operation. (Page 5) |
| A-8-62 | Haynes Stellite Company A Division of Union Carbide & Carbon Corp. | **Alloy Steels**—"Haynes Stellite Metal-Cutting Tools" gives information on chip formation, tool design, and the machinability of metals. (Page 62) |
| A-8-196-3 | Hoggson & Pettis Mfg. Co. | **Hand Stamps**—Catalog discusses the cutting qualities and other advantages of Hoggson steel hand stamps. (Page 196) |
| A-8-145 | Howe & Fant, Inc. | **Turret Drills**—H&F Catalog discusses production economies possible with H&F turret drills. (Page 145) |
| A-8-167 | The Jacobs Manufacturing Co. | **Chucks**—Catalog 100 describes the varieties of Jacobs Chucks. (Page 167) |
| A-8-67 | Kearney & Trecker Corp. Special Machinery Division | **Special Machines**—"Doorway to a Proven Method for Solution of Big and Small Metalworking Problems" is available on request. (Page 67) |
| A-8-58 | Kennametal, Inc. | **Carbides**—Kennametal Catalog 55 and Characteristics Book B-111 are available on request. (Page 58) |
| A-8-15 | The Lapointe Machine Tool Co. | **Broaching Machines**—Bulletin VUE-7-5 describes the electro-motive powered pull-up broaching machine. (Page 15) |
| A-8-66 | P. R. Mallory & Co., Inc. | **Boring Bars**—Bulletin gives technical data on boring with Mallory Bars. (Page 66) |
| A-8-172 | Melin Tool Company, Inc. | **Live Centers**—Catalog 54-C describes the complete end mill line and gives specifications and prices on the Howard Live Center. (Page 172) |
| A-8-230-2 | Metal Carbides Corp. | **Carbides**—Catalog 55-G describes the shapes and sizes of Talide Carbides. (Page 230) |
| A-8-174-1 | Ortman-Miller Machine Co. | **Air and Hydraulic Cylinders**—Catalog describes the complete line of O-M Cylinders. (Page 174) |
| A-8-166 | The Parker Stamp Works, Inc. | **Marking Machines**—Three catalogs are available; Hydra-Pneumatic #700 Marking Machine, fully automatic the #650 and #700 marking machines, and catalog which discusses standard and custom tooling for any application. (Page 166) |
| A-8-204 | Pines Engineering Co., Inc. | **Bending Machines**—Cost-cutting ideas and latest bending and end-finishing techniques are discussed in "Pines News". (Page 204) |
| A-8-171-1 | Red Seal Metals Co. | **Aluminum Tooling Plate**—Advantages of low cost Red Seal Plates and Bars for tooling requirements are described in new brochure. (Page 171) |
| A-8-16 | Richard Brothers Punch Division, Allied Products Corp. | **Punches and Dies**—Catalog discusses the interchangeability and other features of R-B products. (Page 16) |
| A-8-10 | Rivett Lathe & Grinder, Inc. | **Hydraulic Power Units**—Requirements, specifications and drawings are contained in catalog. (Page 10) |
| A-8-190-4 | Geo. Scherr Optical Tools, Inc. | **Toolmaker's Microscope**—Bulletins contain the complete descriptions of Lietz Microscopes. (Page 190) |
| A-8-183 | Sheldon Machine Co., Inc. | **Machine Tools**—Catalogs are available describing: 10", 11" and 13" lathes, Sebastian 13" and 15" geared head lathes, horizontal milling machines and Sheldon 12" shaper. (Page 183) |
| A-8-174-2 | Standard Parts Co. | **Jig and Fixture Components**—66-page catalog discusses the various items produced by Standard. (Page 174) |
| A-8-210 | D. A. Stuart Oil Co., Ltd. | **Coolants**—Sulphur staining is discussed in Bulletin S-1. (Page 210) |
| A-8-160 | Sutton Tool Co. | **Collets and Feeders**—28-page catalog discusses the economies and construction features of Sutton products. (Page 160) |
| A-8-182 | Tomkins-Johnson Co. | **Die Sinking Milling Cutters**—New catalog 4-153 discloses the advantages of T-J cutters. (Page 182) |
| A-8-198 | The Torrington Co. | **Swaging Machines**—Booklet contains descriptions of Torrington Rotary Swagers. (Page 198) |
| A-8-32 | United States Rubber Co. | **Transmission Belts**—Illustrated manual describes U.S. Belts and contains complete standard drive tables. (Page 32) |

BUSINESS REPLY CARD
No postage stamp necessary if mailed in the United States

FIRST CLASS
PERMIT NO. 10782
(Sec. 34.9, P.L. & R.)
DETROIT, MICH.

THE TOOL ENGINEER
ASTE Building
10700 Puritan Ave.
Detroit 38, Mich.
ATT. READER SERVICE DEPT.

**USE THIS HANDY FORM**

to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

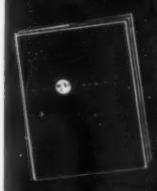
Leading Aircraft *Manufacturers* use

RED METALS CO. SEAL

aluminum tooling plate

Ryan · Rheem · EMCO AIRCRAFT CORPORATION · McDONNELL · ROHR AIRCRAFT CORPORATION · Beechcraft

*Investigate . . .*



The advantages of low cost Red Seal Plates and Bars for your tooling requirements. Call or write for this new Red Seal Aluminum Products Brochure.

RED SEAL METALS CO.
10035 BURTIS STREET, DEPT. D
SOUTH GATE, CALIFORNIA
LOrain 6-5105

INDICATE A-8-171-1

## *Who's Meeting - and Where*

**Aug. 22-23.** STANFORD RESEARCH INSTITUTE AND NATIONAL INDUSTRIAL CONFERENCE BOARD, cosponsors of the Symposium on electronics in automatic production, Sheraton-Palace, San Francisco, Calif. Obtain further information from Public Relations Dept., Stanford Research Institute, Stanford, Calif.

**Sept. 5-6.** AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION. Annual meeting and exposition, Blackstone Hotel, Chicago, Ill. Request more details from association offices, 1900 Arch St., Philadelphia, Pa.

**Sept. 6-8.** MATERIAL HANDLING INSTITUTE, INC. Fall meeting, The Greenbrier, White Sulphur Springs, W. Va. For additional facts write institute headquarters, 813 Clark Bldg., Pittsburgh 22, Pa.

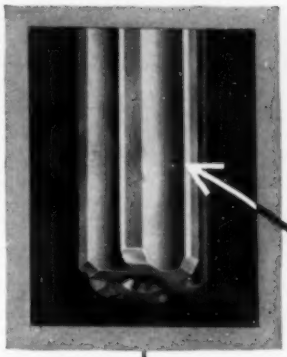
**Sept. 6-17.** NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION. Machine Tool Show, International Amphitheatre, Chicago, Ill. Details concerning the exposition are available from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

**Sept. 6-17.** PRODUCTION ENGINEERING SHOW, to be held in conjunction with the Machine Tool Show, Navy Pier, Chicago, Ill. Particulars may be had from show managers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

**Sept. 6-17.** COLISEUM MACHINERY SHOW (formerly Metalworking Machinery & Equipment Exposition), Chicago Coliseum, Chicago, Ill. Write for details to Chester L. Wells, general manager, Exhibition & Convention Management, Inc., 2689 E. Overlook Rd., Cleveland 6, Ohio.

**Sept. 12-16.** INSTRUMENT SOCIETY OF AMERICA, 10th annual instrument conference and exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. Details are available from exhibit manager Fred J. Tabery, 3443 S. Hill St., Los Angeles, Calif.

**Sept. 14-16.** PORCELAIN ENAMEL INSTITUTE. 17th annual Shop Practice Forum, Ohio State University, Columbus, Ohio. Further details on program



This edge cuts reaming costs

L+I gives you the edge on production

Call your L+I distributor

*The Reamer Specialists*

L & I

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

INDICATE A-8-171-2

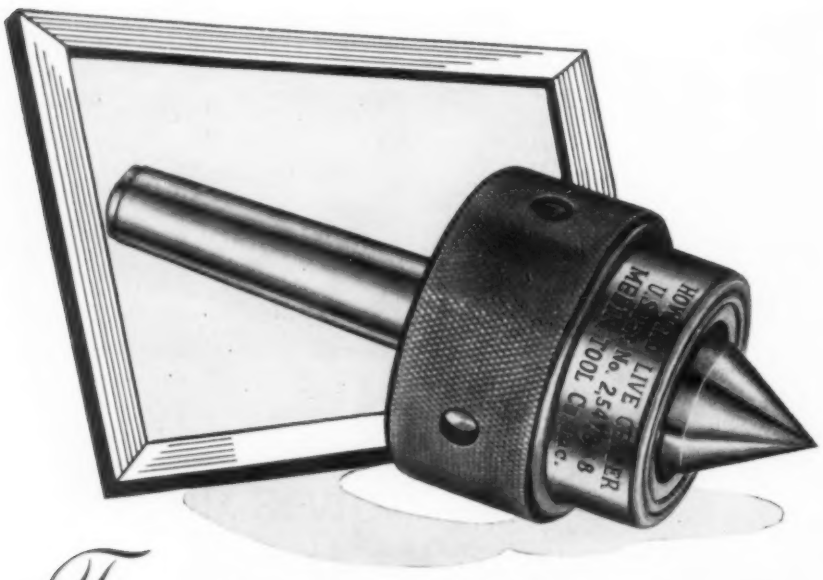
plans are available from institute offices, 1145 Nineteenth St., N. W., Washington 6, D. C.

**Sept. 15-18.** Packaging Machinery Manufacturers Institute. Annual meeting, Homestead, Hot Springs, Va. Complete details are available from institute office, 342 Madison Ave., New York 17, N. Y.

**Sept. 20-22.** Society of Industrial Packaging and Materials Handling Engineers. Tenth annual Packaging & Handling Exposition, Kingsbridge Armory, New York, N. Y. For details, contact society offices, 111 W. Jackson Blvd., Chicago 4, Ill.

**Sept. 26-29.** Association of Iron & Steel Engineers. Annual convention, Sherman Hotel, Chicago, Ill. Contact association office, 1010 Empire Bldg., Pittsburgh 2, Pa. for details.

**Sept. 28-29.** Industrial Electronics Conference—1955, cosponsored by American Institute of Electrical Engineers and the Professional Group on Industrial Electronics of the Institute of Radio Engineers, Engineering Society of Detroit Auditorium, Detroit, Mich. Further information is available from chairman of hotel and registration committee for the convention, Guido N. Ferrara, 8106 W. Nine Mile Rd., Oak Park 37, Mich.

*Finest* **LIVE CENTER MADE**

**. . . HERE'S WHY**

★ **BACK UP RING** assures positive rigidity.

★ Bar Expansion Eliminated by means of Thrust Spring.

★ Special alloy tool steel spindles, hardened and ground.

★ Matched precision ball bearings, mounted in tandem.

★ Oil impregnated bronze tail bearing.

★ Points pre-loaded and ground after assembly.

★ A distinctive oil seal in front of bearings protects them from all foreign matter. Chips, dirt and cutting oil cannot reach the bearings.

The HOWARD Live Center is the *ONLY* center that offers the patented *BACK UP RING*. The Ring maintains solid contact between the quill and head of the center . . . thus greatly increases over-all rigidity.

Send for the new MELIN TOOL Catalog No. 54-C . . . it lists, in addition to specifications and prices on the HOWARD Live Center, the complete MELIN TOOL End Mill Line.

MELIN TOOL CO. INC.

**MELIN TOOL COMPANY, INC.**
3372 West 140th St.
Cleveland 11, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-172


**Oct. 5-9.** World Plastics Fair and Trade Exposition, Los Angeles, Calif. For more information, write World Plastics Fair and Trade Exposition, 8762 Holloway Dr., Los Angeles 46, Calif., care of show management.

**Oct. 6-8.** Society of Industrial Designers. 11th Annual meeting and Design Conference, The Woodner, Washinton, D. C. All details may be obtained from society office, 48 E. 49th St., New York 17, N. Y.

**Oct. 17-21.** National Safety Council. 43rd National Safety Congress and Exposition, Conrad Hilton, Congress, Morrison and LaSalle Hotels. Details are available from council headquarters, 425 N. Michigan Ave., Chicago, Ill.

**Oct. 24-26.** American Standards Association and National Bureau of Standards, joint sponsors of Sixth National Conference on Standards, Sheraton Park Hotel, Washington, D. C., to be held coincidentally with 37th annual meeting of American Standards Association. Write for details to ASA offices, 70 E. 45th St., New York, N. Y.

**Nov. 1-5.** World Symposium On Applied Solar Energy, Phoenix, Ariz. sponsored by association for Applied Solar Energy, Stanford Research Institute and University of Arizona. Write for details to director of public relations at the institute, Stanford, Calif. Symposium will be preceded by a Conference on Solar Energy—the Scientific Basis to be held Oct. 31 to Nov. 1 at the University of Arizona, Tucson, Ariz.

**Nov. 2-4.** National Fluid Power Association. Fall meeting, Chicago, Ill. Get complete facts from association office, 1618 Orrington Ave., Evanston, Ill.

**Nov. 3-6.** National Tool & Die Manufacturers Association. National convention and board meeting, Statler Hotel, Detroit, Mich. For more data, contact association office, 907 Public Square Bldg., Cleveland, Ohio.

**Nov. 13-18.** American Society of Mechanical Engineers. Diamond Jubilee Annual meeting and exposition of power and mechanical engineering Congress, Conrad Hilton and Blackstone Hotels, Chicago, Ill. Write for details to society headquarters, 29 W. 39th St., New York 18, N. Y.

# Technical Shorts...

## Rustproofing For Internal Metal Surfaces

An unusual rustproofing technique for internal metal surfaces of machines during storage or shipment is reported by Nox-Rust Div. of Daubert Chemical Co., Chicago. This company has developed a series of products known as Nucle-oils which are capable of two-phase protection of internal metal surfaces in closed or semiclosed systems.

Conventional preservative oils have proven satisfactory for short-term protection of metal surfaces. During prolonged storage under static conditions, unless these systems such as in fuel tanks, hydraulic systems, and gearboxes are completely filled with oil, the oil coatings on vertical surfaces above the oil level drain down. This permits rust to develop after only short-term protection. To solve this problem, Daubert Chemical researchers successfully combined protective properties of inhibited oils with those of oil-soluble volatile rust inhibitors. The latter vaporizes from the surface of the oil and protects the surfaces above the oil level.

The resultant product is to be produced in a wide range of viscosities, to make them adaptable to varied types of applications.

* * *

## Ceramic Coatings Resist Heat and Abrasion

Feeding powdered ceramic materials through a simple flame gun has been found to result in coatings that provide greater resistance to heat and chemical stability than coatings produced by the metallizing processes. The process, called Flame-Spray Ceramics by its developers at Armour Research Foundation of Illinois Institute of Technology, can be applied to a wide variety of substances. According to Samuel W. Bradstreet, supervisor of chemistry of mineral products in the Foundation's ceramics and minerals research department, the coating is so reliable that in some cases, the underlying metal actually can be melted without causing coating failure.

Technique of application is similar to that required for the metallizing processes. Flame Spray Ceramics are sintered layers of refractory and chemically inert materials, such as aluminum oxide or zirconium oxide. Although ordinary ceramic coatings require heating both metal and ceramic to high temperatures, spray coatings do not require that the metal or other base be heated unduly.

Because the two basic coatings for the new process—aluminum oxide and zirconium oxide—are stable metal oxides, they cannot oxidize further.

Harder than tool steel, the alumina coating is unusually adherent in thicknesses up to about 10 mils. If applied in heavier amounts, residual stresses may cause coating failure on sudden heating or cooling.

Effective uses for the coatings will be for protecting metals such as steel and aluminum against high temperature erosion, protection of soft metals against erosion and abrasion. In addition it is electrically insulative so will probably find applications in the manufacture of high-temperature process equipment. Preliminary tests indicate the coating, because it is poorly wetted by certain molten metals, would be satisfactory as a permanent mold coating for aluminum casting.

Like all sprayed coatings, Flame Spray ceramics have a residual porosity of about 10 to 15 percent and alone will not provide perfect protection against chemical corrosion of underlying material.

**GUIDE PIN BUSHINGS**

**Here is the Hole Difference**

Inside diameters are the hole difference between Lamina Bronze Plated guide pin bushings and ordinary guide pin bushings . . . the difference between costly downtime and continuous, trouble-free press operation.

The secret of Lamina Bronze Plated bushings' outstanding ability to stay on the job is a process* of precision electroplating the exact amount of copper and tin (both are lubricants for steel pins) on hardened steel bushings, wherein the bronze plate becomes an integral part of the steel backing. This ideal combination provides strength along with smooth, free-running action for long-wearing, dependable service. Distortion, seizing and scoring are eliminated.

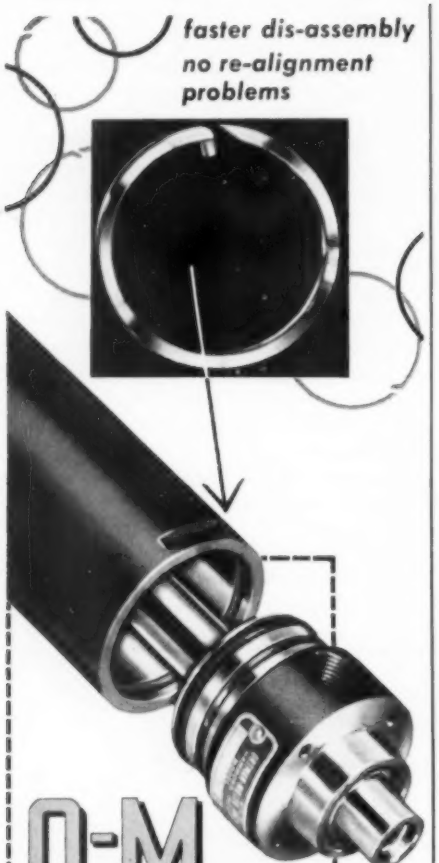
If you have dies in your plant equipped with ordinary bushings, you know the headaches that occur. Now, you can do away with press downtime due to bushing failures. You can reduce part rejects and maintenance costs, increase die life by installing Lamina Bronze Plated guide pin bushings. For the whole story, contact your local die set manufacturer or write to us for your free copy of our new Guide Pins and Bushings catalog.

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

*PATENT PENDING

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-173

faster dis-assembly
no re-alignment
problems



O-M
has the KEY
to simpler
cylinder maintenance

**O-M Cylinders save down-time expense** and headaches when it comes time to replace packing and seals. SPECIAL INTERNAL-LOCKING KEY is released by rotating end cover, which allows quick, easy removal of cover and rod. And re-assembly is fool-proof. There's only one way to take an O-M Cylinder apart, one way to put it together. Key controls positioning . . . locks cover securely. No threads to strip. No tie rods and end caps to bolt together. No time-consuming alignment and adjustment problems.

**O-M Air and Hydraulic Cylinders are available in a complete range of sizes** (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. *Immediate delivery on many sizes.*

**Write today for FREE CATALOG!**

**MAIL COUPON NOW!**

**ORTMAN-MILLER MACHINE COMPANY**
13 143RD STREET, HAMMOND, INDIANA
☐ Have representative call ☐ Send latest catalog
☐ Send ½-scale templates
Name_____ Position_____
Company_____
Address_____
City_____ Zone___ State_____

INDICATE A-8-174-1


# good reading

AIR AND OIL CYLINDERS IN INDUSTRIAL APPLICATIONS. *Published by Industrial Publishing Group, 1240 Ontario St., Cleveland 13, Ohio. Price $5. 122 pp.*

The author has attempted to answer, in a nontechnical manner, frequently asked questions in the field of cylinder design, selection and application. Practical procedures found workable and generally successful are described. A 10-page appendix contains commonly used charts and tables, including specially prepared JIC hydraulic and pneumatic component symbols.

THE DYNAMICS AND THERMODYNAMICS OF COMPRESSIBLE FLUID FLOW, *Vol 2, by Ascher H. Shapiro. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. Price $16. 1185 pp.*

This book presents in a concise manner a comprehensive treatment of compressible fluid mechanics. It contains material of interest to mechanical, aeronautical and chemical engineers, as well as applied physicists and mechanicians.

The author bases the discussions on a combination of clear physical reasoning, theoretical treatment and empirical results. All important results have been reduced to chart form.

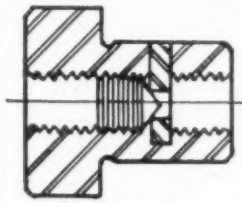
SUCCESSFUL COMMERCIAL CHEMICAL DEVELOPMENT *edited by H. M. Corley. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $7.75. 374 pp.*

The purpose of this book is to document in one volume the most enlightened, present-day knowledge of the important principles of essential steps, as well as the pitfalls to avoid in selecting promising new chemicals and rapidly developing them to the stage of economic importance.

Included in the book's contents are: the need, growth, results and objectives of organized commercial chemical development; external sources of commercial chemical development aid; the selection of continued evaluation of new product projects for sound economic progress, and definitions.

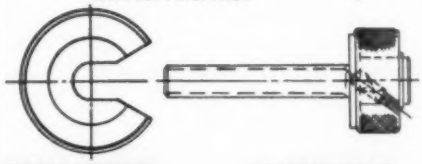

NOBLE & STANTON
Standard
JIG & FIXTURE
COMPONENTS

Just a Few of the Many
NEW ITEMS
in our Line of 500 Components


SURE LOCK
FIXTURE KEYS

DOUBLE CAM LEVERS

FLAT NOSE HEEL CLAMPS
*Soft for Alteration*


EQUALIZING "C" WASHERS
ADJUSTABLE TORQUE SCREWS

**FINEST QUALITY STANDARDS**
**For Your Tooling Program**

Hundreds of time-saving, money-saving components shown in our

NEW CATALOG
66 PAGES
FREE!

*Write for your copy!*
*Tracing sheets available for every part*

**STANDARD PARTS CO.**
1012 BROADWAY • BEDFORD, OHIO
INDICATE A-8-174-2

METALS HANDBOOK—1954 SUPPLEMENT. *Published by The American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price $4 to ASM members; $5 to nonmembers. 184 pp.*

Included in this supplement is authoritative information on the following subjects: carbon and alloy steels, tool and stainless steels, heat-resisting alloys, titanium, magnesium, shot peening, brazed joints, press forming, powder metallurgy and steel melting. The book contains 24 articles supplementing the 1948 Handbook. Prepared by 22 ASM technical committees, it is illustrated with tables, graphs, microphotographs, photographs and drawings.

STRENGTH AND RESISTANCE OF METALS *by John M. Lessells. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $10. 450 pp.*

The aim of this book is to provide design engineers and advanced students information on the behavior of metals under stress as it has been revealed by numerous workers in the field. Most of the discussion centers around the behavior of steel but attention is given nonferrous alloys and cast iron in instances where behavior differs from that of steel. The book contains illustrative problems.

BLAST CLEANING. *Published by Society of Automotive Engineers, 29 W. 39th St., New York 18, N. Y. Price $2 for SAE members; $4 for nonmembers.*

Recent data on blast cleaning are discussed in this illustrated manual. Specifically, it includes information on: blasting machines and abrasives, cleaning practices, production procedures, inspection, shot and grit specifications and measuring shot-blasting machine efficiency.

---

ALUMINUM EXTRUSIONS. *Published by Harvey Aluminum, 19200 South Western Ave., Torrence, Calif. Free on business stationery; additional copies $1.50. 33 pp.*

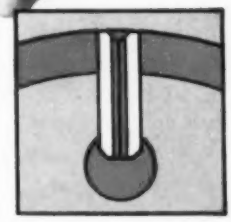
The purposes of this booklet are to point out the many uses to which the aluminum extrusion can be applied in design and to aid users of aluminum extrusion in improving existing designs. Technical material covered includes current applications, design advantages, fabricating, finishes and general characteristics.

... more than double the life of your hydraulic system ... at no additional cost.

Today's production lines cannot afford avoidable machine breakdowns. DUDCO PF-100 Pumps, rated at 2000 psi for continuous operation, provide the extra margin of operating safety which your customers need so badly. The hydraulic system may not require more than 1000 psi – but the extra stamina provided by a 2000 psi DUDCO Pump cuts downtime AND more than doubles the life and dependability of the hydraulic system.

This added safety factor makes sense and saves dollars for the user ... and at the business end of a sale, can make the deciding difference. You pay no premium for DUDCO 2000 psi continuous operation. They cost no more than pumps rated at considerably lower pressures. There's a DUDCO PF-100 Pump in a size and capacity and mountings to fit nearly all standard machine tools.

Users of machine tools can modernize and improve the dependability of their equipment with DUDCO PF-100 Pumps.



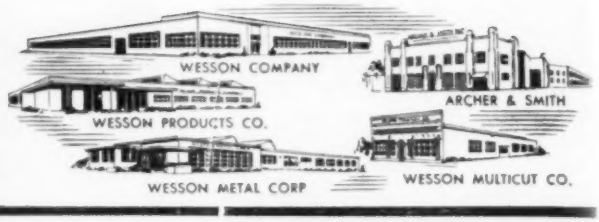
TWO VANES ARE BETTER THAN ONE

The hydraulically counter-balanced DUAL-VANES in DUDCO Hydraulic Pumps eliminate wear producing loads normally caused by unbalanced hydraulic forces and vane acceleration. DUAL-VANES also maintain MULTIPLE SEALING BARRIERS to slippage and power loss. DUAL-VANES are a patented and exclusive DUDCO feature.

*Get the facts on the Dudco PF-100 Dual-Vane Pumps and Fluid Motors. Write today.*

DUDCO DIVISION
THE NEW YORK AIR BRAKE COMPANY
1702 EAST NINE MILE ROAD • HAZEL PARK • MICH.
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-175

carbide NEWS




# New Wessonmetal "26" Boosts Tool Life 40%

***Optimum performance of "nearly universal" grade extends over range of 100 to 400 sfm***

Gains in tool life ranging up to 40% over other steel cutting grades are reported for Wesson Metal Corporation's new Grade 26. The new steel cutting carbide has consistently outperformed all other steel cutting grades in 95% of all machining operations on which it has been applied.

Indications now are that the new Grade will produce significant increases in tool life over approximately 80% of the entire steel machining range. While created primarily to handle all types of steel rough and semi-finish machining—light, medium and heavy duty—it also is proving highly effective on some finishing operations.

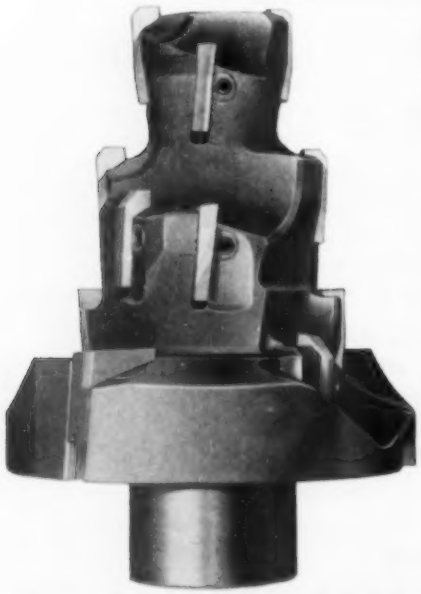
What is more, the new Wessonmetal grade is not limited to a narrow range of cutting speeds. Optimum performance for Grade 26 extends over a range of 100 to about 400 sfm, covering 95% of steel machining operations encountered in industry today.

Since Grade 26 is the closest approach to a "universal" carbide for steel cutting yet produced, it reduces the number of grades required for steel cutting operations by as many as four grades. Problems of grade selection are greatly simplified, therefore, by the new Wessonmetal grade.

Much of Grade 26's outstanding performance is due to its superior cutting edge strength. Particularly important at the elevated temperatures generated at high cutting speeds, are the carbide's inherently high red hardness combined with high thermal conductivity.

Grade 26 is now in full production at Wesson Metal Corporation's new metals plant in Lexington, Ky.

*Tool life took a big jump on this severe interrupted cut on a forged steel tractor brake band anchor. Cutting speed ranges from 280 sfm down to zero. Feed is .027", depth of cut is ⅛".*



*A total of eight chamfering, semifinishing, finish boring and facing operations are performed at each of five stations with these cutters on a W. F. & John Barnes boring machine.*

# Multi-Diameter Cutters Slash Tool and Machining Costs

Special eight-operation cutters designed by Wesson Company engineers permit a major builder of commercial air conditioning units to achieve a sizable reduction in the cost of machining compressors.

Solid Wessonmetal Grade GS blades are used on the cutters to produce 3600 cylinders per grind, compared with only 250 cylinders per grind previously. Grinding takes one-third as long as on tools previously used.

Although solid carbide blades are used on this operation, these special multi-diameter cutters are typical of the many other special Wesson designs incorporating standard blades which provide interchangeability of solid carbide, carbide tipped or HSS blades without modifying blade slots.

tools Wesson carbide Wessonmetal

*For answers to your machining problems write:*

**WESSON COMPANY, DEPT. AD,** 1220 Woodward Heights Blvd., Detroit 20, Michigan

# AIR GAGING IN AUTOMATION

technical digests

**By A. Wiseman**
Chief Electrical Engineer
The Sheffield Corp.
Dayton, O.

Some of the reasons for the growth of automatic gaging are immediately apparent. For instance, an operator's duties no longer leave him the time required for hand gaging, or production rates may be so high that it would be impossible to hand gage. Other reasons have evolved out of the growth of automatic gaging rather than being prime reasons for its inception. Nevertheless, they are today as important and will perhaps come to overshadow the reasons for building the first automatic gage.

The modern automatic gage, *Fig.* 1, can do much more than merely indicate if a part is or is not acceptable. It can have a vital role in determining production. It can, for instance, determine if a machining process is under control and, if not, can initiate action to bring it under control or shut down the process until the proper adjustments are made. This sensing nature of the modern automatic gage starts with the gage itself.

Location gaging, *Fig.* 2, presents the biggest challenge to the gage designer. In gaging the center distance of two holes, for instance, it is generally desired that this dimension be gaged independent of the size variation of the holes. The problems become acute when the hole diameter tolerances approach the center distance tolerances.

Surface finish may be an important consideration in gaging, despite what size or location is being gaged. It is illogical, of course, to set close tolerances when the surface finish is extremely rough. Consequently, finish may determine the exact method of gaging.

Another important factor in applying automatic gaging is print tolerance. It seems evident that tolerances set forth on the print should be in keeping with the job requirements and the ultimate required performance of the product. Yet it is not uncommon for an automatic gage to reject a large percentage of all parts produced when it is first installed. This is occasioned by the usual de-bugging required when new equipment is installed, and the press of production schedules which do not permit adequate time to work out difficulties before production begins.

Because of the dependence of machine tools on electrical sequencing and control, it is imperative that any automatic gage be capable of producing an electrical signal. This is true regardless of how the actual gaging is done—mechanically, electronically, or pneumatically.

A mechanical gage uses levers and sensitive limit switches. It is most often employed on rather broad tolerance work or for applications such as sensing the presence of holes. Electronic gaging involves the conversion of the motion of a stylus into an electrical signal. This signal is generally fed through detector and amplifier circuits before being utilized for relay switching. Pneumatic gaging makes use of air pressure changes in the system to operate very sensitive pressure switches which in turn produce electrical signals.

Of the three, pneumatic gaging, *Fig.* 3, is used most in production systems because of its sensitivity, versatility and simplicity. Some automatic gaging sys-

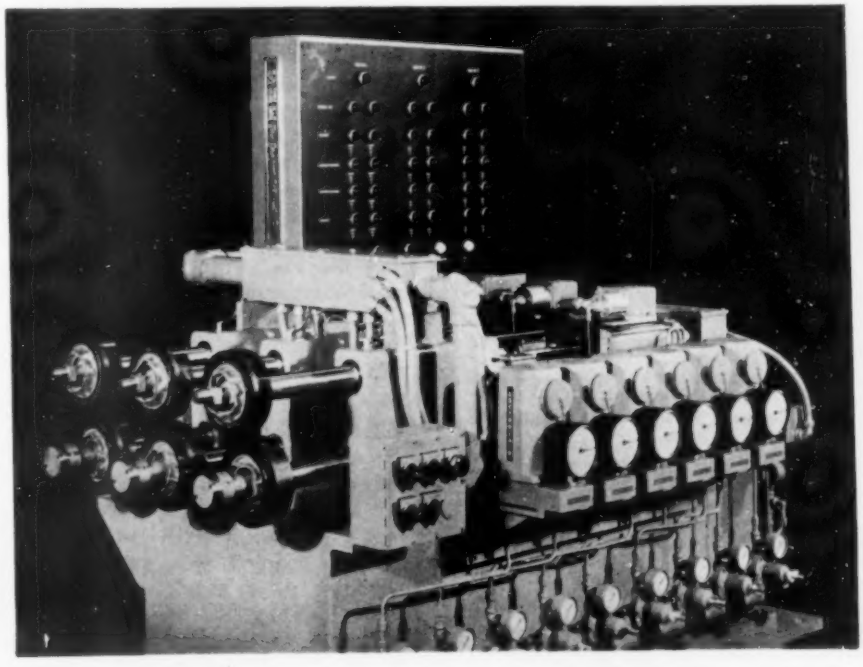


**Fig. 1. Assembly-of-part process gage to simultaneously gage pin and crank bore holes in three automotive connecting rods. Gage is mounted as one station on a four-station indexing automatic boring machine.**

# ELECTROLYTIC GRINDING with ELECTRONIC control CUTS COSTS as much as 60%

## Anocut's NEW free manual tells how!

Here are the facts behind the theory, practical application and benefits of electronically controlled electrolytic grinding by new equipment perfected by Anocut Engineering Company. This informative manual covers the Anocut equipment necessary and its simple operation in grinding and shaping carbides, alloy steels and other hard-to-work materials. Presents documented field tests showing, for example:

**Over 90% savings in diamond wheel costs**
**Far faster cutting speeds**
**Better, more uniform finishes**
**Longer tool life**

*Send for your copy today!* Manual will be sent by return mail on receipt of coupon below.

**ANOCUT**+
*"The electronic "plus" in grinding*

**Anocut Engineering Company**
**141 W. Jackson Blvd.**
**Room 2300, Board of Trade Bldg., Dept. B**
**Chicago 4, Ill.**
**Send copy of "The New Electrolytic Shaping Method"**

NAME_____
POSITION_____
FIRM NAME_____
ADDRESS_____
CITY_____ STATE_____

INDICATE A-8-178




tems will contain elements of all three types. Of course, the selection of the type of gage is always determined by the application as well as the preference of the machine tool builder and the user.

In addition to being classified according to the gage, automatic gaging can be classified according to application. It breaks down into two major categories: in-process, in which the gaging is done while the part is being machined; and post-process, done after the machining is completed and usually at a point removed from the process. The method used will be determined by the design of the machine and by the application of the gaging information.

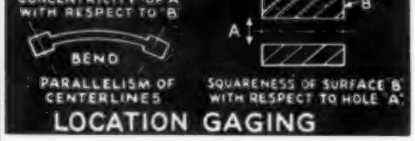



**Fig. 2. Various types of location gaging that can be done automatically.**

With in-process gaging, the designer frequently bumps heads with a rather inflexible physical law which says that two objects cannot occupy the same space at the same time. In many cases, it is not physically possible to gage at the point of machining. The sensing and controlling facilities an automatic gage can offer will be affected somewhat by the manner of gaging. For instance, an ideal cycle for an in-process method would provide for a change from roughing cut to finishing cut when a predetermined dimension is reached as well as for retraction of the tool when final size is reached. An ideal cycle on a post-process gaging cycle would provide signals to: (1) adjust the tool when parts are being produced outside the control limits; (2) segregate rejects from the process line; and (3) stop the machine or process when too many rejects are being produced.

The type of dimension to be gaged, the number of parts produced simultaneously, the type of cutting tool used, size of part, and the type of fixtures used all govern the extent to which the desirable features of a gage may be exploited. As an example, in gaging a center distance or other location type dimension, no adjustment signal could

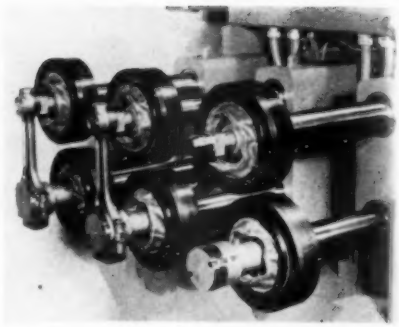


**Fig. 3. Close-up of *Fig.* 1, showing connecting rods on gaging spindles. Approximate time per gaging cycle is five seconds.**

be utilized by the machine. In this case, warning signals, audible or visible, and "stop-machine" signals can be used.

Production of more than one part simultaneously presents a problem of removal of rejects from a transfer type machine. It may be uneconomical or too space consuming to provide a reject-removal feature for each part. The problem is further complicated when pallets are used, since it may be necessary to remove pallet and part as a unit. In such a case, a "stop-machine" signal is used and the reject parts are either removed manually or marked and allowed to continue if subsequent operations are not affected. Rejects are then removed at the end of the process.

The matter of gage selection is frequently overlooked. For best results, the gage and machine design should be coordinated. The more the gage is required to do, the more vital this coordination becomes. The gage supplier should be contracted as early in the design of a new machine tool application as possible. The same is true of revamps of machines in the field. Cooperative design effort between the machine tool builder and the gage maker pays worth-while dividends.

Automatic gaging has just scratched the surface of possibilities and the future looks bright.

From a paper presented at the Machine Tool Electrification Forum, April 19-20, 1955, Buffalo, N. Y.

▼ ▼ ▼

## Engineers' Responsibilities for Leadership

**By Dr. John Bell Rae**

**Massachusetts Institute of Technology**
**Cambridge, Mass.**

Harnessing of atomic energy is, of course, preeminently an engineering function. Tremendous potentialities exist in the industrial use of atomic

power, some of which are now being experimentally tested.

Insofar as we apply technology to improving the material well-being of mankind, we are applying it to the promotion of peace. The areas of the world which show the greatest degree of political and social instability are those in which standards of living are low. Poverty has always been a potent cause of unrest and conflict.

The remedy lies in the patient and orderly development of resources, which in turn calls for the intelligent application of the skills of the engineer. Technological advance and material prosperity are synonymous and through them we can reasonably hope to eliminate some of the worst sources of the discontents that lead to war.

I know of no technical device which will cure human fallibility. However, to the extent that we are able to provide a better life for a greater number of people, we can help eliminate despotic rulers.

### Engineers as Executives

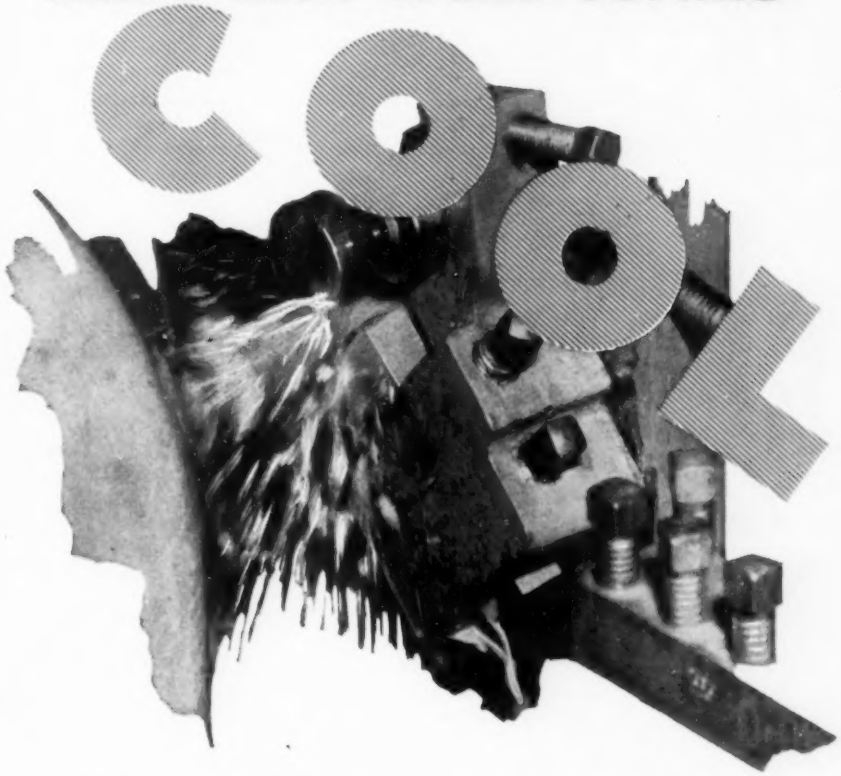
During the last half-century there has been a steadily increasing flow of engineers into positions of executive responsibility. Evidence indicates that the present-day engineering graduate has about one chance in two to moving into management. A similar trend, although probably on a smaller scale, exists in government. The engineer is not only the creator of technological change, but to a constantly greater degree is also the person who has to decide what to do about it. Here is both a responsibility and an opportunity. Perhaps the greatest contribution the engineer can make in this role is to carry into these other fields something of the professional integrity which is expected of the good engineer.

There is an underlying philosophy that in the engineering profession a high salary is less important than delivering an honest product. This should be applied generally to business, government, and to relationships between nations.

There is no predetermined answer to solve all problems. The engineer's approach should be: what do we want to accomplish? what are the relevant facts? and, given these facts, what is the best way to go about achieving our objective?

There are, of course, fundamental principles which must be adhered to, both in technology and in the formulation of national policy, but this is not

Improved Lusol
KEEPS HIGH SPEED CUTTING COOL



If you machine the toughest metals at high production rates, particularly with carbide tools, you'll get better results with Lusol. This oil-free, chemical, transparent, metal-working solution has the highest heat-removing quality of any coolant *at the point of cutting*. Lusol's tiny droplets get right to that point, keep tools, work and chips cool. Tools last longer, finish is better, closer tolerances are possible in work pieces because uniform low temperature machining minimizes expansion and contraction. And Lusol is good to work with. It is a combination coolant, cleanser, rust preventive and water conditioner. It is non-irritating to the skin and does not cause odors or smoke. Users from coast to coast depend on Lusol — because it's BETTER FOR THE WORK AND BETTER TO WORK WITH. Write for complete information.

THE Lusol LINE
FOR BETTER METAL WORKING

*Lusol*
For tough metals, high speeds, heavy feeds. One product for both machining and grinding.

*Lusol Super Concentrate*
Double-strength Lusol for minimum storage and handling.

*Lusol K-7*
For grinding. Combines cooling and lubrication.

*Lusol Shamrock*
An all-around chemical emulsion.

*Lusol Unikool*
Universal low-cost transparent coolant.

*Lusol Machine Cleaner*
Cleaner and germicide.

*Lusol G-3 Germicide*
Kills bacteria.

*Lusol Tapcool*
A series of threading and tapping compounds.

THE Lusol LINE . . . BETTER PRODUCTS FOR BETTER METAL WORKING

F. E. ANDERSON OIL CO., INC.
PORTLAND, CONNECTICUT 4A055A

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-179

the same thing as assuming that all situations are alike and that what works in one case will work equally well in another. The difficulties involved in international relations today are numerous and complicated; they have no simple solution. They can be met, but only if systematic, dispassionate analysis and evaluations are used. If the engineering profession can disseminate this mental process that may well be its most vital contribution to peace.

From a paper, "Engineering Skills Work for Peace," presented at the ASME Spring Meeting, April 20, 1955, Baltimore, Md.

## Atomic Energy for Industry

**By Dr. John R. Dunning**
**Dean, School of Engineering**
**Columbia University**
**New York, N. Y.**

Most of the American economy eventually will be on atomic basis. All authorities agree that nuclear fission will become a major factor in the total energy picture; they disagree only on the timing. There is no choice but to push atomic development because of the rate at which the country has been moving toward an energy deficit.

The electric power industry is doubling in size every seven or eight years, and installed horsepower on industrial production lines is equivalent to 250 slaves for every man doing physical labor.

America uses 13 times as much power per unit of population as any other country in the world, and with only 6 percent of the world's population, it produces more of almost any product than the rest of the world put together. Energy consumption is rising faster than the population—at a rate that is going to be difficult to maintain over the long pull. Without some new source of energy, such as the atom, the country soon will be energy-poor.

The atom offers an almost unlimited source of energy; the limits are set only by technical knowledge. Uranium is able to supply at least 100 times as much energy as coal, oil, and water, and it is still an infant technology in terms of efficiency of utilization.

Six groups are planning major-scale atomic power plants. So far, $300 million of private funds is going into nuclear central station power plants. This development will represent a significant contribution to the total energy supply. Although the plants now projected will be primarily experimental in nature, they will perform even better than now is predicted, just as the atomic submarine did. The atomic aviation program also is progressing.

Too much publicity has been given to atomic bombs and not enough to the peaceful uses of atomic energy, which really constitutes today's technological revolution.

The industrial uses of atomic energy must be a major instrument of national policy, in this and other countries. The present level of world industrialization is sufficient to give only a small fraction—perhaps 20 percent—of the world's population a standard of living equal to ours. For this reason, atomic power is even more necessary, economically and technologically, to the rest of the world than to us.

From a talk given at the American Management Association Conference, Hotel Roosevelt, New York, N. Y., May 23-25, 1955.

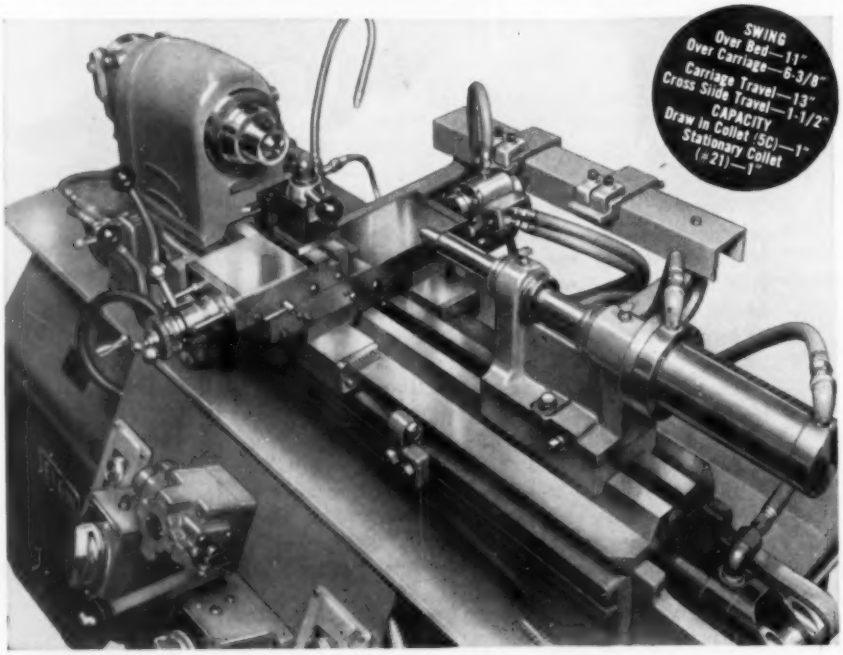
▼ ▼ ▼

## Titanium Research . . . Key to Expanded Use

**By L. S. Busch**
**Dir. of Research**
**Mallory-Sharon Titanium Corp.**
**Niles, O.**

Research work on titanium has been designed to investigate those phenomena which create difficulties in the manufacture or in the use of titanium. Some of the important questions researchers ask themselves are: Why is alloyed beta titanium sometimes brittle and sometimes ductile; why are laboratory

ELGIN PRECISION
*for more than 50 years*
*Announces its* NEW
PRECISION HYDRAULIC TRACER LATHE




Elgin Tool Works announces the development of its New Hydraulic Tracer Lathe, a precision machine for close duplication of smaller parts in large or small lots.

This machine is hydraulic in its primary duplicating functions and includes air operated features to facilitate part loading, unloading and clutch—brake drive operation.

*See our Booth No. 320 at the Chicago Coliseum*

ELGIN TOOL WORKS, Inc.
1773 Berteau Avenue, Chicago 13, Illinois.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-180

eats consistently better in properties han production heats; why are some lloys more difficult to melt than oth- rs? Another one which has puzzled researchers for years is why does ti- anium stick to everything, including lass?

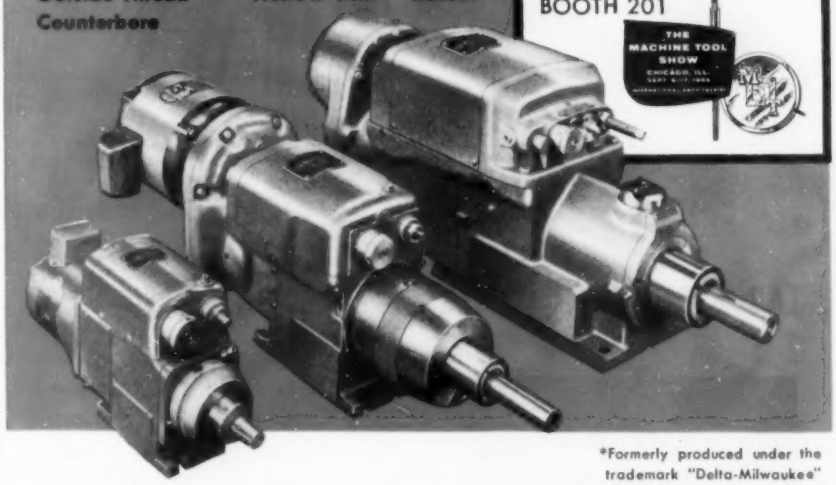
Having posed these problems, how do researchers go about solving them? About one-half the time on any problem is spent in planning the experimentation and analysis of the results. Unless the work is properly planned, its correct analysis is difficult if not impossible. The other half of the total time spent is done by skilled laboratory technicians who actually do the heat treatment, prepare specimens and run testing machines.

What has been accomplished by research to date? A production material of 6 percent aluminum, 4 percent vanadium alloy has been developed to fill present requirements of the engine industry. This alloy is relatively free of difficulties in manufacturing. It is more tolerant of hydrogen than others and has excellent high-temperature properties. The ideal alloy for airframe use is still under development but the hope is in the near future to try in production some of the new materials which have come out of the laboratories. Generally speaking, sheet alloy has the required properties when properly manufactured and fabricated, but is much more difficult to handle than aluminum or stainless steel. Research has gradually, but definitely given improvements in quality. What does research promise for the future?

If progress made in the next five years with regard to gathering essential information on the problems posed previously is equivalent to that made in the past two years, the following materials can be expected to be ready for production evaluation by users of titanium:

1. Sheet alloys which can be formed in a soft condition and aged to strengths of 200,000 psi with a saving in weight over stainless of about 30 percent.
2. Forging alloys which will compete with high heat treat steel at 280,000 psi ultimate (at room temperature) with a saving of 40 percent in weight.
3. High temperature alloys which will have the required creep characteristics at 800 F and possibly at 1000 F. Possibly oxidation resistance rather creep strength will become the limiting factor in use of these alloys at this point.

In addition, process improvements

HARTFORD Special
DRILL UNITS*
combined with our other
STANDARDIZED COMPONENTS
offer LOW COST AUTOMATION
on these operations:
Drill—Single and Multiple Spindle
Deep Hole Drill
Countersink
Outside Thread
Counterbore
Ream
Spot Face
Center
Chamfer
Hollow Mill
Tap
Bore
Mill
Face
Recess
BOOTH 201
THE MACHINE TOOL SHOW
CHICAGO, ILL.

*Formerly produced under the trademark "Delta-Milwaukee" by the Rockwell Mfg. Company
Absolute depth and feed control plus high rapid traverse make "Hartford Special" Drill Units workhorses on high production jobs requiring accurate machining operations. These flexible components can be combined with other Hartford standardized components to provide low cost automation to every manufacturer through machines of his own construction. Our large staff of Sales Engineers is ready to study your processing problems and make recommendations to lower your manufacturing costs.

HARTFORD Special
MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
280 Homestead Avenue, Hartford 12, Conn.
A-503-8
☐ Have Field Engineer call.
☐ Send Application Data Sheet and Descriptive Bulletin.
Name_____
Company_____
Address_____
City_____ Zone____ State_____
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-181

REMOVE METAL FASTER...
REDUCE DIE COSTS

LARGEST SELLING CUTTERS FOR TOUGH DIE SINKING

T-J Cutters properly designed and heat treated for high speed work in tough die steels.

You'll find T-J Die Sinking Milling Cutters are top favorites in die and forge shops everywhere today—because they're *extra rugged* . . . produce more work between grinds! Designed for speed, accuracy and long life . . . hold a sharp edge longer . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes . . . T-J dependability! Send for new catalog 4-153. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-182



should give improved cleaning methods which produce material substantially free of hydrogen, rolling methods which improve quality and lower cost and annealing and heat treating equipment which will produce scale-free sheets and minimize cleaning problems.

From an address given at the Mallory-Sharon Editor's Day Symposium, March 8, 1955.

▼ ▼ ▼

## Automation and Jobs

**By John N. Hart**
**Dir. of Employee Relations**
**The B. F. Goodrich Co.**
**Akron, O.**

New, automatic systems of industrial production create jobs rather than reduce the size of the working force. Automation will be resisted nevertheless, by all classes within industry on the grounds that industry is trying to remove the human element and replace men by machines.

The major problem concerning automation does not appear to be so much the development of the machines to do the job. Rather, it seems to be the task of convincing employees and the general public that the acceptance of this mechanical approach is to their benefit rather than to their detriment.

Increasing ability to produce in quantity opens more vistas and provides growth and security for the individual and the nation. Economists say there will be an increase of about 22 million consumers during this decade, but the number of producers will increase by only about 2 million. To maintain or improve the standard of living in the future, the ability to utilize resources available must be multiplied.

Even enlightened people resist change. This tendency is a purely normal reaction. When this human frailty is coupled with fear of lost security, it is understandable why industry can expect mass resistance to mechanical innovations.

The manager of tomorrow must be, above else, a promoter. He must know the facts and promote them; he must convince the mass of the people that the salvation of their standard of living lies in the acceptance, not the resistance of new and better ways of effectively producing consumer goods and services.

From an address given at the mid-Ohio management council conference, Marietta College, March 1955.

# Field Notes...

**Minnesota industries** will keep abreast of nuclear developments pertinent to its future life through the efforts of three of its large industrial firms which have entered into a joint undertaking in the field of atomic energy on the premise that their pooled experience will enable them "to evaluate and further nuclear developments of interest to the state and its industries." All three, Northern States Power Co., Minneapolis-Honeywell Regulator Co. and General Mills, Inc. are engaged in nuclear activities in their respective business fields. An organization called the Minnesota Nuclear Operations Group, was set up by the three presidents to administer the cooperative undertaking. This group will determine objectives and activities in the atomic energy field that will be beneficial to the state in its industry. It will make recommendations to the member companies regarding methods by which those objectives can best and most practically be achieved.

V V V

**Dedication ceremonies** of Minnesota Mining and Mfg. Co.'s new Research Center were highlighted by an exhibition of latest industrial applications for magnetic recording tape. Featured among the exhibits were magnetic tapes for use in automatic control of machinery; Scotch brand instrumentation tape as it is used for critical data recording; video tape, an application of which was dramatized through its use for a cross-country telecast; a wide-band radar recorder built for the Air Force for use in recording images of radar screens.

Among the exhibitors were Automation Corp. of America, division of Magnasync Mfg. Co. Ltd., which demonstrated automatic control of machinery by magnetic tape; and International Business Machines Corp., which showed magnetic tape transport mechanism of the latest of the electronic brains.

## licensings

**An advance in** gear manufacture was announced recently with the licensing of the Lees-Bradner Co. by Grob, Inc. to develop, manufacture and market the Grob Gear Rolling Process. The Grob Process cold-forms metal in contrast to normal methods of cutting gears and splines, and metal flows to the desired shapes and dimensions.

V V V

**First license** for application of Norton Co.'s new series of coatings to extend use of metals to higher temperature ranges has been granted to the Bettinger Corp. Bettinger, which is a leading company in production and application of high temperature ceramic coatings, worked closely with Norton in formulating the new series, called Rokide. This series permit metals to be used at temperatures ranging from 3000 to 3600 F and are expected to have their widest application on rockets, missiles and ram jet parts.

## purchases

**United States Hoffman** Machinery Corp. has purchased the Intercontinental Mfg. Co., Inc. According to the announcement, the purchase was in keeping with U. S. Hoffman's planned program for expansion and diversification of its sales and manufacturing activities.

V V V

**As part of** its diversification and expansion program, Ronson Corp. has acquired the Hydraulics Units, Inc. of Pasadena, Calif. which now becomes a wholly-owned subsidiary. Byron D.


SAVE VALUABLE SHOW TIME!

Chicago, Illinois
Sept. 6th-17th

Write for your FREE Admission Form Now!

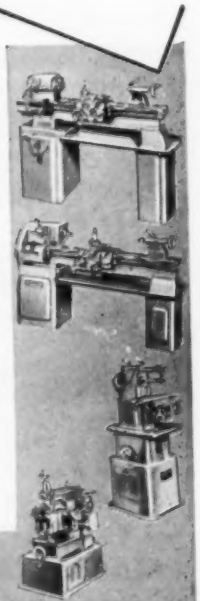
Fill in this blank. Cut it out and mail it to us now. We will send you a complimentary admission ticket to the *Coliseum Machinery Show*. By presenting a filled-out admission ticket at the entrance to the show, you will save all registration delays and entrance fees. (*The Coliseum Machinery Show is on your way from the "Loop" to the Machine Tool Show.*)

More Time to See "All Three"

1. Machine Tool Show (International Amphitheatre)
2. Coliseum MACHINERY SHOW (Chicago Coliseum)
3. Production Engineering Show (Navy Pier)

(COLISEUM MACHINERY SHOW)
(Free Admission Service)
SHELDON MACHINE CO., INC.
4229 North Knox Ave. Chicago 41, Ill.
Gentlemen: Please send my free admission ticket to the Coliseum Machinery Show.
Name
Company Name
Title
Street Address
City State
☐ Company ☐ Home
I AM ALSO INTERESTED IN NEW CATALOGS DESCRIBING:
☐ Sheldon 10" ☐ 11" ☐ 13" lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine
☐ Sheldon 12" Shaper
☐ Have representative call

All of these will be demonstrated at the COLISEUM SHOW BOOTH 702 CHICAGO



*Write for these new catalogs to preview our "tools in action" display at the Coliseum Machinery Show, Booth #702.*

✔ CHECK the wide range of Sheldon precision toolroom and production lathes, milling machines and shapers you want to be sure to see.

✔ CHECK the important features of these modern machine tools that you will want demonstrated.

✔ CHECK-IN at Sheldon Booth No. 702, Chicago Coliseum Machinery Show. Take your own test cuts. Test, for yourself, the performance of these new and modern cost-saving machine tools.

SHELDON

*Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes.*

SHELDON MACHINE CO., Inc. • 4229 North Knox Ave. • Chicago 41, Ill.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-183

STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

*On Brown and Sharpe, and other automatics*

**INSERT CHASERS SAVE UP TO 33%**

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $40 you get a dozen sets of ¾–16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Selecting the Proper Die Head for the Job".

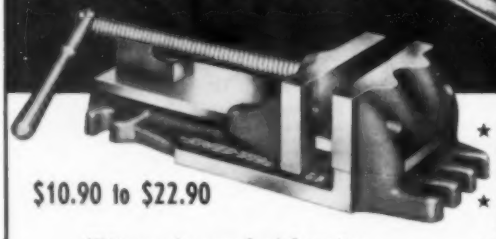
**THE EASTERN MACHINE SCREW CORPORATION** 27-47 Barclay St., New Haven, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-8-184-1

**Speed Versatility and Economy**

Tooling costs go down when Speed Vise goes on the job because Speed Vise eliminates the need for expensive jigs and fixtures. Just a simple jaw plate to fit the part being drilled and Speed Vise does the rest. Several interchangeable Speed Vise jigs and fixtures can be made for the cost of one old style box type jig. The operation of Speed Vise tooling is **many times faster** than the operation of such conventional jigs and fixtures. Speed Vise tooling is economical to build, efficient to use, compact to store.

**SPEED VISE GIVES YOU 100 JIGS IN ONE**



**$10.90 to $22.90**

★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.

★ Standardized holes for attaching jigs or jaw plates.

★ Lift...slide...lock...that's all there is to the fast, positive locking action.

★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.

Write or wire now for information

**CARDINAL MACHINE COMPANY**

1819 Dana Street, Glendale, California

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-8-184-2


Gilmore and Harry E. Johnson, president and vice-president, respectively, of Hydraulic Units, continue in active management as officers.

V V V

**All assets of** The Heller Co. have been purchased by a group including Leo T. Norville, senior partner in the Chicago law firm of Norville & Dent, Alfred A. Strelsin, president of Cenco Corp., and Hugh Fulton, partner in the New York law firm of Fulton, Walter and Halley. A new Delaware corporation, The Heller Corp., has been created to operate the company. Joseph F. O'Brien, president of O'Brien and Co., and formerly president of Pierce Laboratories, Inc., was named to replace the company's founder, Harold S. Heller, who died last year. No other changes in management are expected.

V V V

**Announcement has** been made of the purchase of The Denison Engineering Co. by American Brake Shoe Co. Denison now becomes a wholly owned subsidiary of Brake Shoe. W. C. Denison, founder and president of the acquired company, will remain as president and chief executive officer. No changes will be made in Denison management or operations.

V V V

**Vulcan Crucible** Steel Co. has been purchased by H. K. Porter Co., Inc. to become the twelfth Porter Div. James O. Flow, president of Vulcan, now will be vice-president and general manager of the division. Besides the existing Vulcan sales representatives located throughout the country, sales organization for the division in the South will be that of Porter's Connors Steel Div. in Birmingham.

## expansions

**One of the country's** most modern plants for production of automation machines and special machine tools will be created with completion of an expansion program scheduled for Snyder Tool & Engineering Co. The $500,000 expansion, representing a fifty percent increase in floor space for production facilities, will be completed by early fall of this year.

V V V

**Plans for a** new bar mill for Northeastern Steel Corp. are taking shape as work has begun toward this first specialty steel mill in New England. Site for the mill is on the harbor at Bridgeport, Conn. The installation, which represents a capital investment of approximately $4,000,000, is scheduled for op-

ition early in 1956. With the addi- n of the new mill, together with new ctric furnaces, overall capacity of rtheastern Steel will be increased to 0,000 tons of ingots annually.

V V V

**Ultra Modern** manufacturing facili- s, primarily designed for production their recently introduced automatic crew machine, are being completed r Brown & Sharpe Mfg. Co. Objec- ives considered when planning the acility, and which have been carefully arried out, included provision for: ompletely manufacturing all parts sed in the new machines; sufficient quipment for normal production, yet with possibility for necessary expan- sion at any time; straight forward pro- duction flow with emphasis on time and motion economy; and special ma- terials handling equipment.

V V V

**Widest hot sheet** rolling mill ever designed and built is being installed at the Davenport (Iowa) works of Alum- inum Co. of America as a further phase in the three-year-old defense-support- ing expansion of aluminum sheet roll- ing facilities. The new 160-in. wide hot mill, when in full operation about two years from now, will add an estimated 725 persons to the Work's employment rolls. This $20-million installation marks the fifth major project in the continuous expansion program which has been underway since 1952.

V V V

**Construction has started** on the 45,000 sq ft, single story addition to the Mount Carmel, Ill., plant of Snap- on Tools Corp.

### moves

**Detroit branch** office and warehouse for Standard Tool Co. has been moved to new quarters at 10731 Puritan Ave. The facility, which serves all of Michi- gan as well as parts of Ohio and Indi- ana, is under the direction of Detroit district manager F. H. Shuman.

V V V

**Vlier Engineering,** Inc. has moved into a new building on Santa Monica and San Vicente Blvds. in Los Angeles, Calif. With the move, the company en- larged both its office and manufactur- ing facilities.

V V V

**Move into its** new $500,000 plant has been completed by the Wilton Tool Mfg. Co., Inc. Location of the new building, which houses both the gen- eral office and factory, is 9525 Irving Park Rd., Schiller Park, Ill.

Courtesy of Brown & Sharpe

W+B INDUSTRIAL LUBRICANTS

**THE FIRST GRINDING LUBRICANT**

W & B Grinding Lubricant E-1, the first lubricant made especially for wet grinding, for half a century has been the choice of leading manufacturers all over the world.

**W & B E-1 offers these advantages:**

- HIGHEST REFLECTIVE FINISH
- EXTREMELY LOW MICRO-INCH READING
- ROUGH AND FINISH GRIND WITH THE SAME WHEEL
- AGREEABLE TO OPERATORS

W & B E-1 is just one of a complete line of metalworking lubricants made by White & Bagley Co., specialists in the field for 67 years!

Let a W & B lubrication expert help solve your metalworking problems. Just mail the coupon *today.*

**THE WHITE & BAGLEY CO.**
**103 FOSTER STREET • WORCESTER, MASS.**

W+B INDUSTRIAL LUBRICANTS

Please send without obligation, a W & B Lubrication Expert to our plant for consultation.

Name_____ Title_____

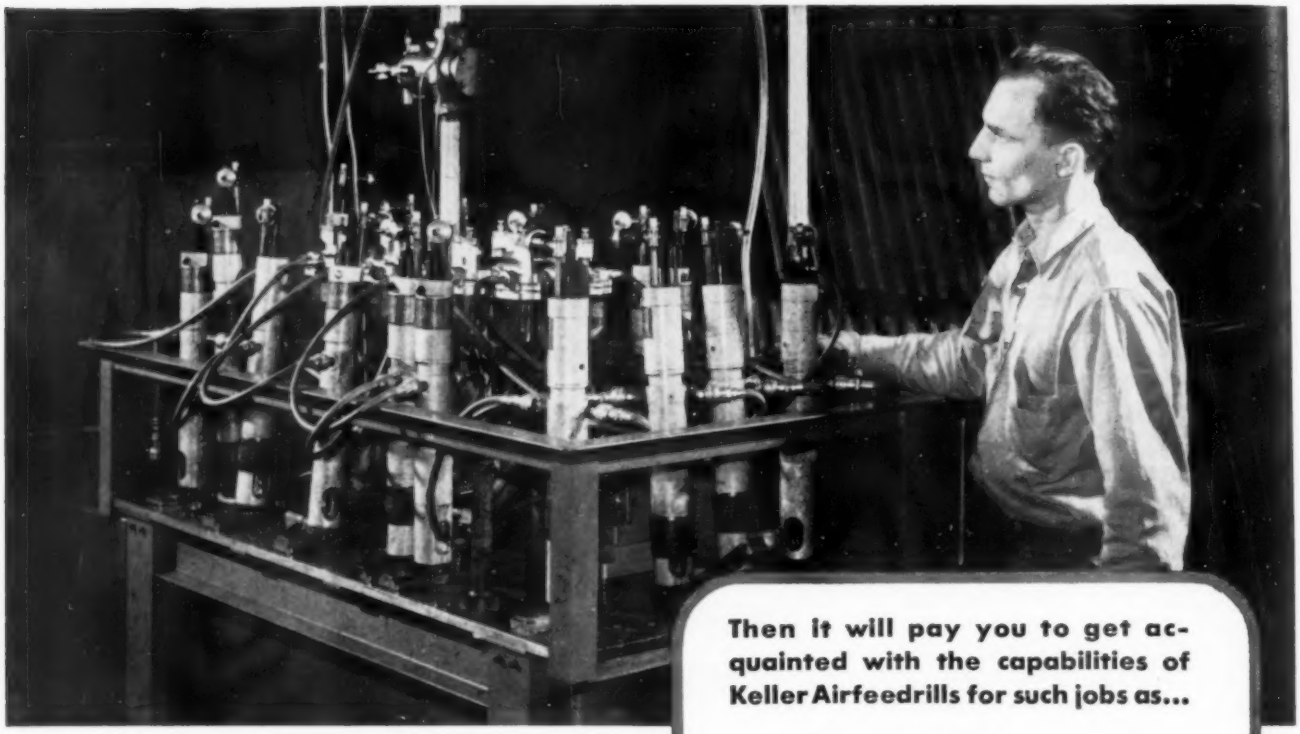
Company_____

Street_____

City_____ Zone____ State_____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-.8

# Can automatic production help you improve quality . . . *reduce costs* ?



*A typical automatic production setup using 14 Keller Airfeedrills. Pressing a single control valve drills 14 holes simultaneously in a refrigerator outer shell assembly—the drills advance, drill, retract, and shut off automatically.*

These remarkable tools work without supervision, and take the place of expensive machines in automation setups. They are entirely air controlled and operated, automatically cycled, and extremely accurate.

Among the special advantages available are sensing type rapid advance, hydraulic feed control, and adjustable torque control. Thus they are able to do peck drilling, skip drilling, and other jobs that heretofore have required expensive machine tools.

Write and tell us about your machining problems. We will send appropriate bulletins or have a representative call to discuss Keller Air Tools.

**Then it will pay you to get acquainted with the capabilities of Keller Airfeedrills for such jobs as...**

- **DRILLING**
- **REAMING**
- **COUNTERSINKING**
- **TAPPING**
- **CENTER DRILLING**
- **CHAMFERING**
- **COUNTERBORING**
- **SPOTFACING**

GARDNER-DENVER Since 1 K KELLER TOOLS

# KELLER TOOL

DIVISION OF GARDNER-DENVER

GRAND HAVEN, MICHIGAN

*For Years, Milne Has Been Delivering Hollow Die Answers* To Tooling Problems..*

*All are Genuine Tool Steels

GRAPHITIC
HOLLOW DIE STEEL
Widest Range Of Applications Including forming, drawing, sizing, flanging, embossing, and combination dies, work support blades, forming rolls, steel mill straightening rolls, machine parts, plug, thread and ring gauges, cams, bushings, sleeves, mandrels, fixtures and other applications.

# NOW MILNE has the answer to a diemaker's dream!

- MINIMIZES MACHINING
- CUTS WASTE
- PRODUCES SUPER WEAR-RESISTANT, NON GALLING TOOLS

**JIC-06 . . . Oil Hardening, Non-Deforming . . . Full Length Kolorkoted Pink and Gray for Permanent Identification**

This new combination of Timken Graphitic Steel features in Hollow Die (Tubular Tool) form is Milne's latest bee-line to better, lower-cost tooling.

Has a double advantage over standard oil hardening tool steels.

1. Free graphite makes it the fastest, easiest machining tool steel in tubular form and insures non-seizing properties.
2. Diamond-hard carbide particles guarantee super wear resistance.

Rough turned O.D. and I.D. Saw cut faces. Furnace annealed — no scale. Cut to any length.

*Stocks of a range of sizes being built to meet demand. Write for a stock list and Milne's new Hollow Die Catalog section.*

***Available Across The Nation . . . Wherever Milne Operates***

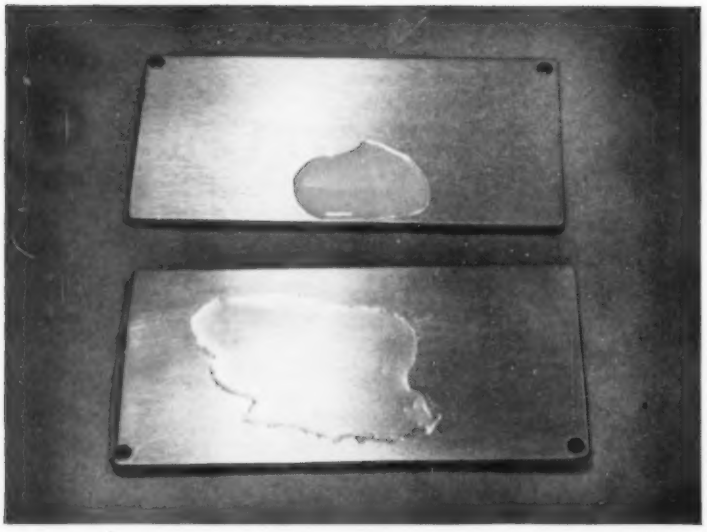
AM30

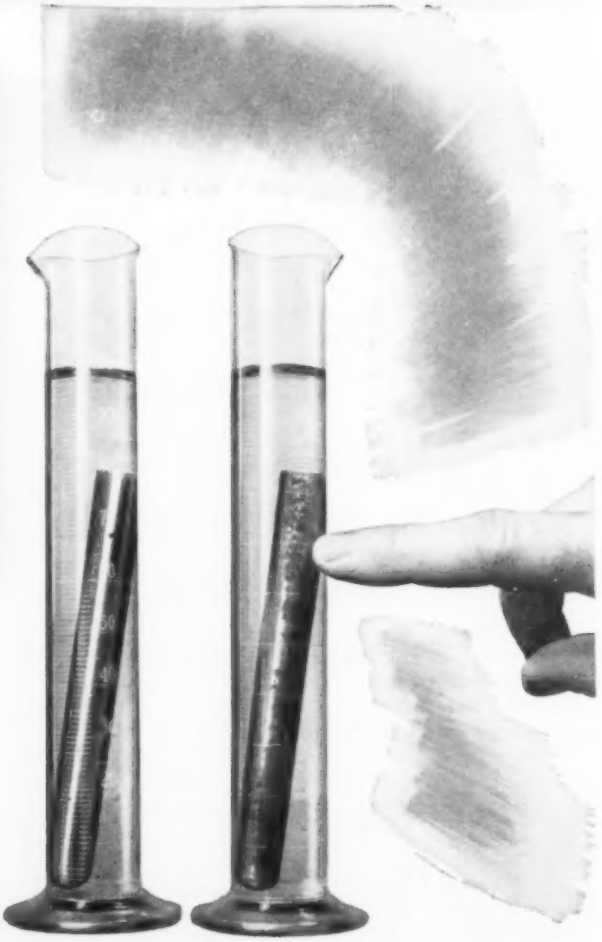
| WAREHOUSES | SALES OFFICES | SALES AGENTS | | |
|---|---|---|---|---|
| NEW YORK | DETROIT | TAYLER SPOTSWOOD OF CAL LOS ANGELES | GEOFFROY-LANE, INC. DENVER | SANDERSON-NEWBOLD, LTD. MONTREAL-TORONTO |
| CHICAGO | ROCHESTER | | | |
| BOSTON | ST. LOUIS | PACIFIC MACH. & TOOL STEEL CO PORTLAND, OREGON | | |
| NEW BRITAIN, CONN. | BRIDGEPORT | | | |
| PHILADELPHIA | LOUISVILLE | MAXWELL STEEL CO. INC FORT WORTH, TEXAS | | |
| PITTSBURGH | WORCESTER | | | |
| CLEVELAND | MILWAUKEE | D. A. JACKSON, INC SALT LAKE CITY | | |
| DAYTON | SEATTLE | | | |
| SAN FRANCISCO | | | | |
| ATLANTA | | | | |

**Complete line of tool steels . . . Wide range of grades and sizes.**

**A. MILNE & CO.**
Established 1887
745 WASHINGTON ST., NEW YORK 14, N.Y.
*America's Leading Tool Steel Specialists*
*Complete Line Of Tool Steels—Hollow and Solid*

# *Announcing*
# SHELL
# DROMUS OIL E





**Above:** Cooling action of a cutting fluid is directly related to its wetting ability. Conventional soluble oil emulsion (background) "balls" up. Equal amount of Shell Dromus Oil E spreads out thinly . . . wets far greater area.

**Right:** Plain carbon steel, if left in water at room temperature for about two hours, will rust as shown. Sample on left was in a 1-30 solution of Shell Dromus Oil E and water *for six months without rusting.*

## SHELL DROMUS OIL E

# *NEW CUTTING OIL*

## *permits higher speeds and faster feeds than ever maintained before*

***Shell Dromus Oil E,*** a new solution-type fluid, wets all metal surfaces with extreme rapidity and keeps both work and tools exceptionally cool. These qualities permit an increase of machine speeds and/or feeds far beyond anything allowable with conventional soluble oils.

### *IT'S MUCH EASIER ON TOOLS*

There's much more life in any cutter or abrasive wheel when protected by this new oil. *It stays put* between tool and work. (At a 1-80 dilution, average tool life increase in extended field tests was about 50%.)

### *IT FIGHTS RUST*

Shell Dromus Oil E is readily soluble in hot, cold, soft or hard water, and stable in any concentration. Even at low concentrations, it gives excellent rust protection to all ferrous metals, *including*

### *IT KEEPS WORK COOL*

Even at stepped-up production rates, you'll find less heating and better finish wherever this new oil is used.

### *IT SETTLES OUT FAST*

Chips and wheel particles settle out immediately . . . the recirculated fluid is clean and free from contaminating particles. It is *not* sticky or greasy . . . leaves no deposits on machines or work.

### *IT'S GREAT FOR GRINDING*

Grinding wheels remain clean, *even when material retains a film of cutting oil from a previous operation.* Even cast iron can be ground cleanly when Shell Dromus Oil E is used to cool the work.

---

**If all this reads "too good to be true," we suggest that you try Shell Dromus Oil E *on any problem operation you have.* It *is* that good!**

**SHELL OIL COMPANY**

**50 West 50th Street, New York 20, New York**
**100 Bush Street, San Francisco 6, California**

GEORGE L.
*Detterbeck Quality Tools*
SPEED UP
Screw Machine Production

SELECT YOUR NEEDS FROM THIS LIST

*We specialize in*
CUTTING CAMS
•
HIGH SPEED STEEL AND CARBIDE FORM TOOLS
•
SPECIAL CUTTING TOOLS
SPLIT DRILL BUSHINGS
•
CROSS SLIDE KNURL HOLDERS
•
TOOL BITS
•
BOX TOOLS
•
BURNISHING TOOLS
•
REVOLVING STOPS
•
RECESS SWING TOOLS
•
FORMING SWING TOOLS

We manufacture cams and tools for the trade on a production basis. As a result we offer:

1. Superior type tools . . . at low cost.
2. Practical design accuracy.
3. Correct specifications which insure maximum service.

Your tool requirements in our hands is your guarantee of better tools at a great saving.

**PROMPT DELIVERIES**

Tool making with us is a routine matter. Special equipment . . . skilled hands . . . plus know how, enables us to fill orders in a minimum of time.

**SERVICE**

Let us quote on your tool requirements. You'll save money . . . even as compared with "home made" tools.

Standard circular form tools for B&S and Davenport Machines carried in stock. Immediate delivery.

Established 1911

44 years at the same address.
Our service is nation-wide.
We have no branch factories.

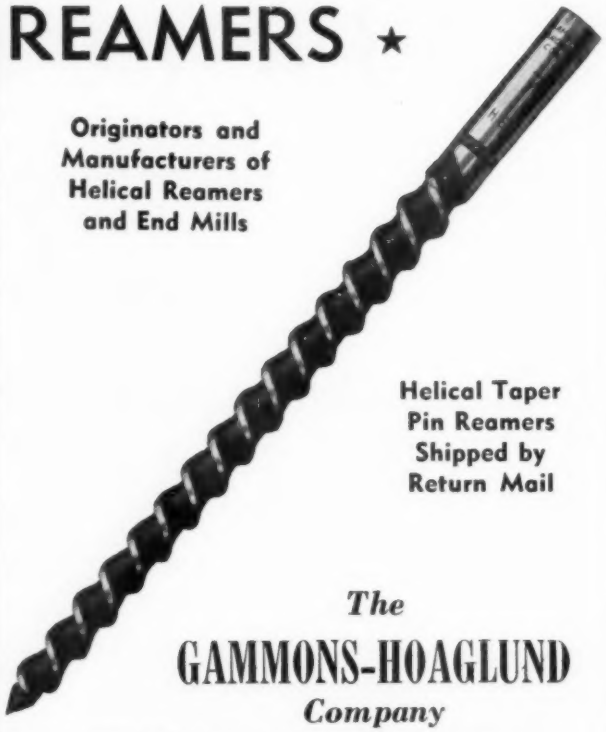
GEORGE L. DETTERBECK CO., Incorporated. 1871 Clybourn Ave., Chicago 14, Ill.
*ENGINEERS TO AN INDUSTRY*

USE READER SERVICE CARD; INDICATE A-8-190-1



GAMMONS REAMERS ★

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

*The*
GAMMONS-HOAGLUND
*Company*
400 Main Street, Manchester, Conn.

USE READER SERVICE CARD; INDICATE A-8-190-3

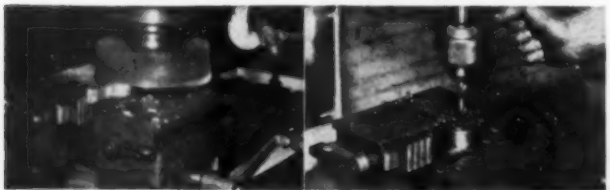


THE VISE WITH A
THOUSAND GRIPS

**"FLEXIBLE JAWS" GRIP *ANY* SHAPE!**

Positive grip vise. Grips any irregular shape. Grips secure and positive for the most precise milling, drilling or cutting operation. Eliminate the time and expense of blocking and shimming irregular pieces for toolroom machining. Try it in your shop. Save time and dollars on small production runs. Write for complete information now.

AT THE CHICAGO & PHILADELPHIA SHOWS
(booth 912) (booth 2047)



AMPOGRIP
CONTOUR GRIPPING UNIVERSAL FIXTURES

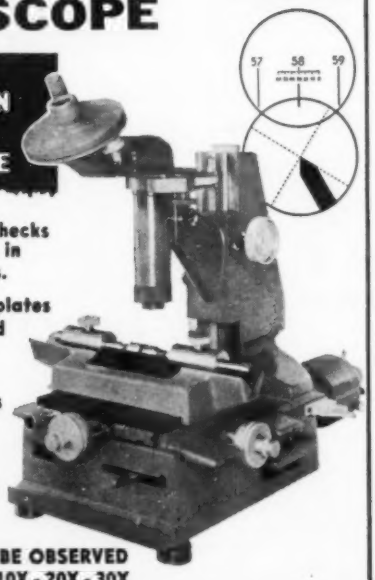
AMERICAN POSITIVE GRIP VISE CORP.
4-D Olivine Street • Willimansett, Mass.

USE READER SERVICE CARD; INDICATE A-8-190-2



NEW LEITZ
TOOLMAKER MICROSCOPE

...PRODUCES HIGHEST PRECISION
....CUTS INSPECTION TIME



The NEW LEITZ DESIGN checks angular measurements in degrees and minutes.

Contains all Thread Templates for U. S. National thread profiles 6-80 pitch.

Contains Radii Templates from 21/64" to 13/16" by 1/64". Concentric circles from .010" to .280" by .010" and one blank compartment.

NOTE: TEMPLATES CAN BE OBSERVED IN 3 MAGNIFICATIONS: 10X - 20X - 30X

*BE SAFE — SEND FOR LATEST BULLETINS*

Geo. SCHERR OPTICAL TOOLS, Inc.
200-TE LAFAYETTE STREET • NEW YORK 12, N. Y.

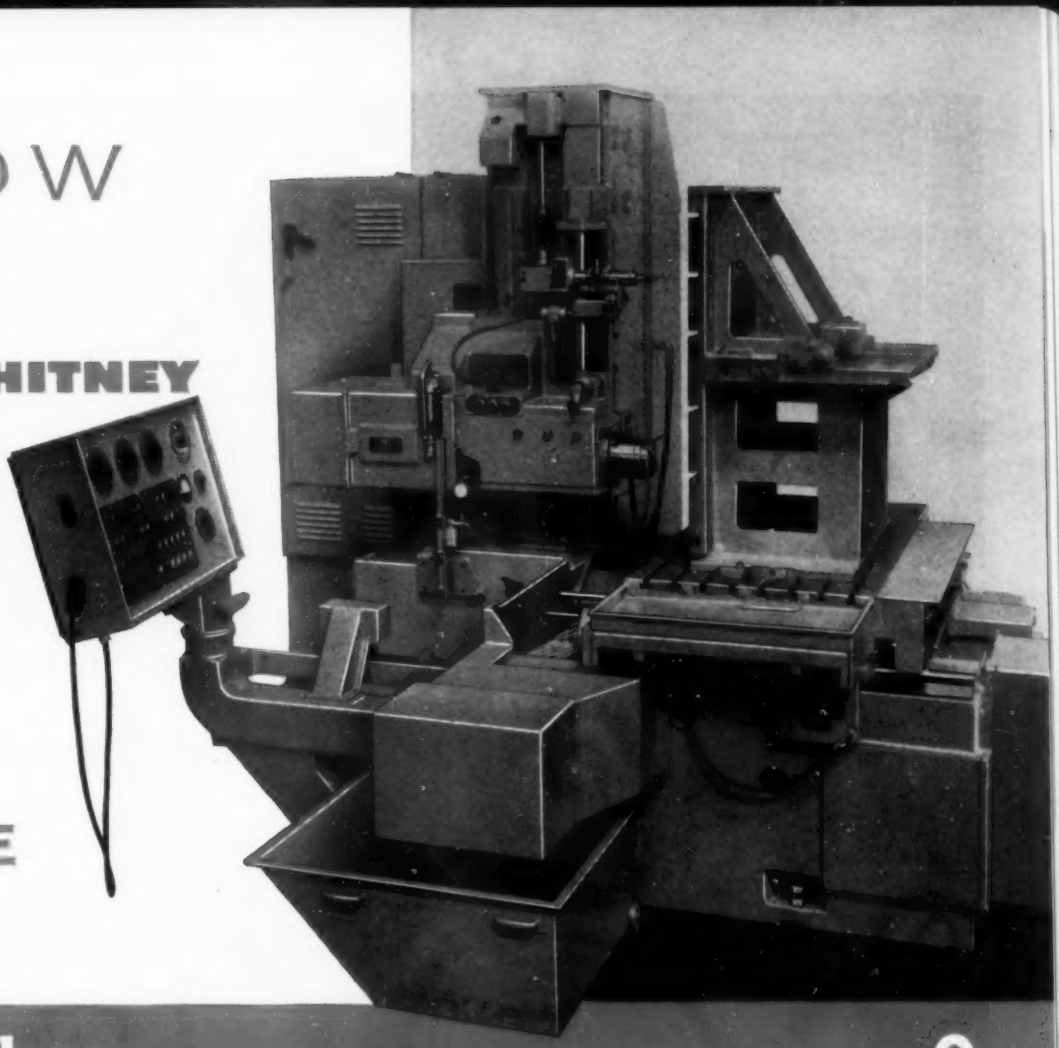
USE READER SERVICE CARD; INDICATE A-8-190-4

AND NOW

A NEW

# PRATT & WHITNEY KELLER

AUTOMATIC
TRACER-CONTROLLED
MILLING
MACHINE



## THE BL 3622 MODEL C

WITH THESE IMPORTANT *NEW FEATURES* . . .

- **HEAVIER, MORE RUGGED** . . . to take tough production schedules in stride day after day.
- **MORE POWER (10 hp)** . . . for increased metal removing capacity on today's tough new alloys.
- **BIGGER CAPACITY** . . . to handle larger, heavier workpieces.
- **WIDER RANGE of SPINDLE SPEEDS** . . . with a single, full-range spindle for all speeds . . . 30 to 3600 rpm in 20 steps. Spindle furnished with either No. 12 B&S or No. 50 MM taper bore.
- **POWER DRIVEN CHIP CONVEYOR** . . . no need to stop and shovel chips piled up by fast metal removal.
- **FASTER TRACER RESPONSE** . . . through a new electronic control of machine motions, travel speeds, and feeds.
- **PHENOLIC-TO-METAL BEARING SURFACES** . . . eliminate scoring of ways and preserve original high accuracy.
- **OPTIONAL RAPID TRAVERSE** . . . for vertical and horizontal movements.
- **ONE-SHOT LUBRICATION SYSTEM** . . . insures quick, positive thorough lubrication of all important sliding surfaces.

The NEW BL 3622, Model C is a powerful, horizontal spindle miller that reproduces the shape of any 2-dimensional template or 3-dimensional full model quickly and accurately. Complex or irregular dies, molds, prototypes and other workpieces that cannot be conveniently machined by any other method are handled as easily and economically as simple work. The Keller BL Machine is built ***specifically*** for tracer-controlled milling — not just "adapted". It is rugged, dependable, relatively simple . . . stays on the job year after year.

**PRATT & WHITNEY**
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U.S.A.

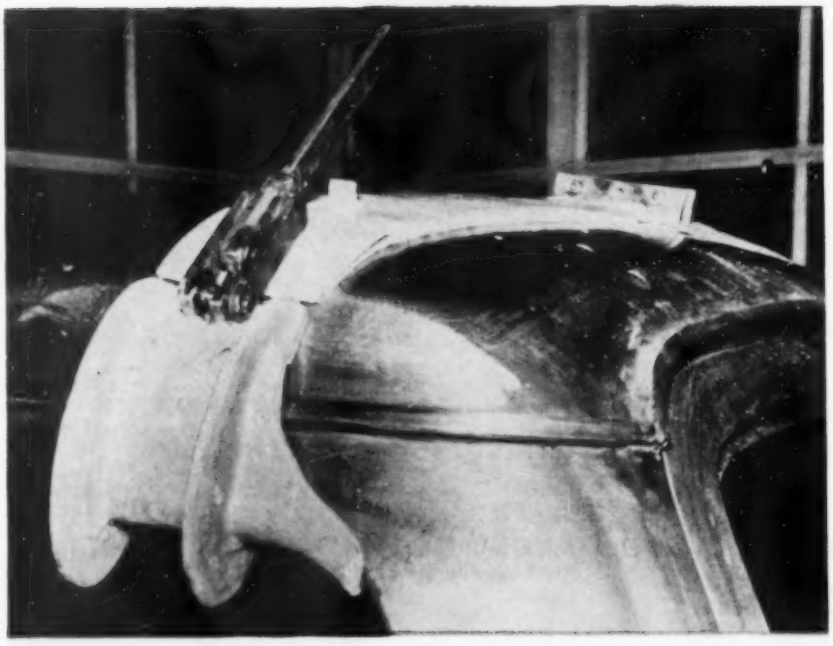
BRANCH OFFICES . . . BIRMINGHAM • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES
NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER
SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

**FOR COMPLETE INFORMATION** . . . write on your Company letterhead for P&W Circular No. 588 . . . or phone the P&W Branch Office near you.

SEE IT AT THE SHOW, SPACE 1219.

FIRST CHOICE FOR ACCURACY SINCE 1860 MACHINE TOOLS • CUTTING TOOLS • GAGES

# Tooling time cut 50% with compounds based on BAKELITE TRADE-MARK Epoxy Resins



**REZOLIN *Toolplastik* Compound** was cast against a finished body to form this spot welding jig. Time: only 21 hours compared with 45 to 80 needed to make one of conventional materials. Based on BAKELITE Epoxy Resin, this tooling compound is produced by **Rezolin, Inc., Los Angeles 45, Calif.**

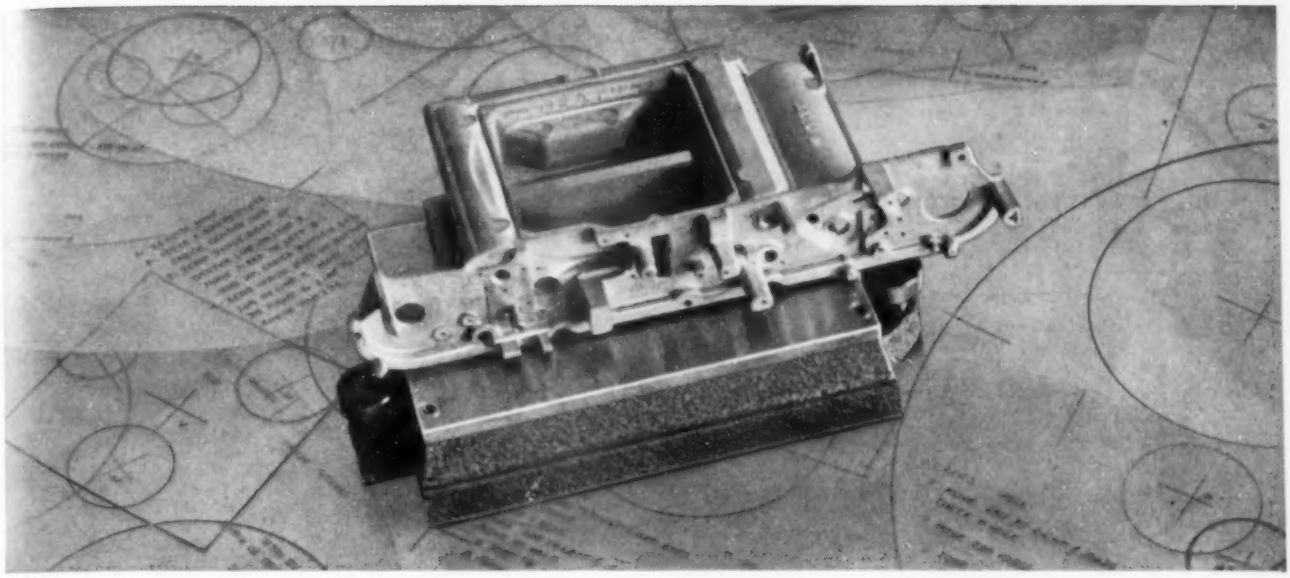
Now metalworking tools can keep up with fast model changes. Less time, lower costs result because BAKELITE Brand Epoxy Resins offer these advantages:

- **Liquid compounds—can be cast to shape without pressure**
- **Cured at room temperature—no applied heat**
- **Minimum shrinkage—minimum finishing**
- **Excellent flexural, compression, and impact strengths**
- **Outstanding dimensional stability**
- **Light weight means easy handling**
- **Laminated with glass cloth to form jigs, spotting racks, fixtures, and Keller models.**

For further information, write Dept. JU-181

BAKELITE BRAND
Epoxy Resins for Tooling

**BAKELITE COMPANY,** *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
*In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC



# How Graflex, Inc., *cut production costs* with a Kodak Contour Projector

**If you've been thinking of optical gaging only in terms of toolroom measurement or final inspection, see what it does when linked to production operations.**

GRAFLEX, INC., was producing a complex precision part in which spacing of 40 holes and 12 bosses had to be held to ±.001″.

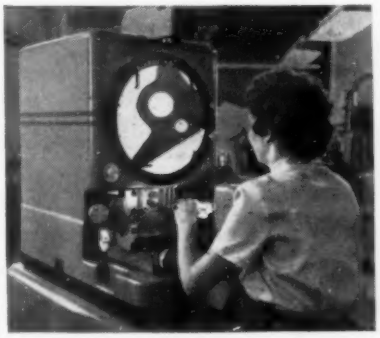
To solve this tolerance problem, Graflex used a Kodak Contour Projector because: (1) mechanical gages would have been too costly for the required run; (2) optical gaging would be faster; (3) the Kodak Contour Projector gave a quantitative as well as qualitative check.

***Here's how this helped cut production costs and speed the work:***

Optical gaging made it possible to check parts as they were run, to discover errors before more time and labor were spent on the part; no expensive machining was wasted on parts later found to be out of tolerance. It assisted in assembly operations, too, since the exact condition of the parts was known. And the part could be quickly rechecked at any point during production when a question of tolerance or condition arose.

A Kodak Contour Projector was also used in final inspection—doing in 20 minutes a job estimated at 4¾ hours by surface plate inspection. When the run was completed, the comparator was available for another job.

Perhaps you have production problems that can be solved by fast, accurate, *complete* measurement and inspection. There's a field representative in your area who can evaluate your needs for you. To get in touch with him, or for a copy of the illustrated booklet "Kodak Contour Projectors," mail the coupon below.



Graflex, Inc., used a Kodak Contour Projector, Model 2A, for this operation. The Model 2A is completely equipped for precision micrometry. In addition, it has a magnification selector, built-in surface illuminator, and permits the staging of parts in any plane. As with all Kodak Contour Projectors, it requires no hood.

## the KODAK CONTOUR PROJECTOR

44

**EASTMAN KODAK COMPANY**
**Special Products Sales Division, Rochester 4, N. Y.**

☐ Please send me a copy of your booklet "The Kodak Contour Projectors."
☐ Put me in touch with your representative.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____
(Zone)

Kodak
TRADE-MARK

# Lapping For Precision Flatness and Parallelity in Production Quantities

## ...with a LAPMASTER

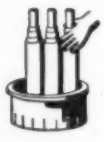
This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

## THIS IS HOW THE LAPMASTER WORKS

**I,** a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

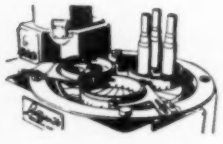
**1** Operator requires no previous lapping experience.

**2** Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.



**3** Simplicity of design provides accessibility and allows ease of loading and unloading.

**4** Loose abrasive distributed evenly over lapping area insured uniform results.



**5** Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.

**6** Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

**CRANE PACKING COMPANY**
1823 Belle Plaine Ave., Chicago 13, Illinois
In Canada: Crane Packing Company Ltd.
617 Parkdale Ave. N., Hamilton, Ont.

Lapmaster Division — CRANE PACKING COMPANY — 38 YEARS INDUSTRIAL PROGRESS

# SEE AUTOMATION IN ACTION

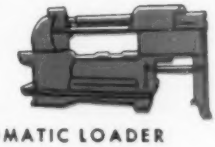
# Lo-swing

EXHIBIT

**SPACE 1013**

NEW LATHES

A NEW DRILLING HEAD

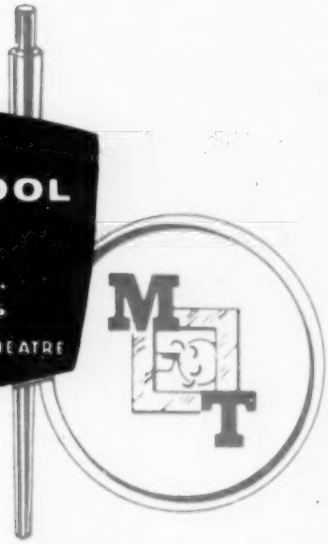


A NEW AUTOMATIC LOADER

A NEW DRILLING, REAMING, AND TAPPING MACHINE

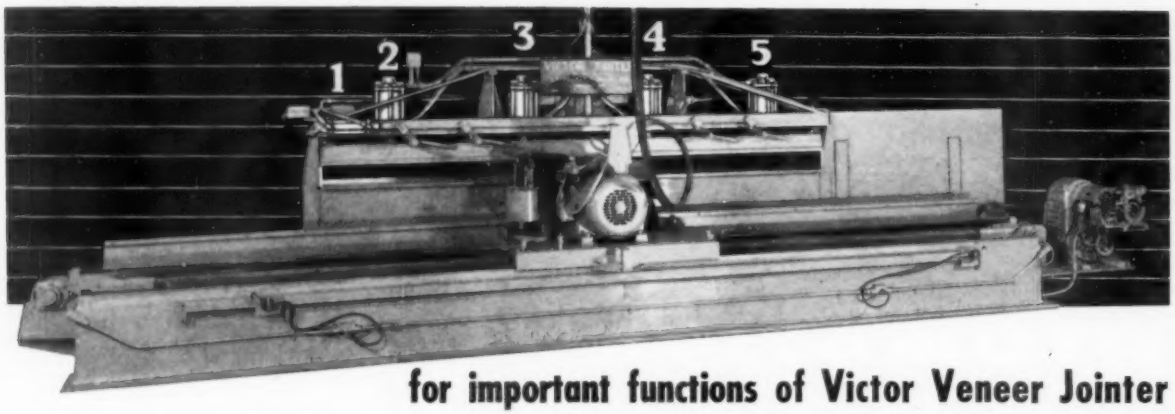
**THE MACHINE TOOL SHOW**

CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE




**SENECA FALLS MACHINE COMPANY • SENECA FALLS, N. Y.**

# 5 NOPAK Cylinders supply pressure and pull




## for important functions of Victor Veneer Jointer

The Victor Straight-Line Veneer Jointer, built by the E. V. Prentice Co., Portland, Ore., employs a NOPAK Model E 2½" x 6" Cylinder to operate the stops which align the stock, and 4 NOPAK Model D, 6" x 5" Cylinders to exert adequate, equalized clamping pressure on the full length of the stock to be joined. All cylinders are controlled from a single station to provide for fast precision alignment and clamping in a rapid, repetitive work cycle.

This is another example of the important role played by NOPAK Cylinders and Valves in actuating and controlling precision machine movements. Others are shown in the NOPAK Application Manual. Ask your NOPAK Representative to show you this helpful book.

Refer to Classified Section of your Telephone Directory for name of nearest NOPAK Representative.

**GALLAND-HENNING NOPAK DIVISION**
2750 S. 31st STREET • MILWAUKEE 46, WISCONSIN

**NOPAK**
® VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A 8443-½H

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-196-1

*You're not gambling*
*IF you have an* **ACE in the hole!**

ACE DRILL BUSHINGS are always a sure bet!

- *Quality* • *Accuracy*
- *Largest Deliverable Stocks Anywhere!*

Over 22,000 sizes, types and specifications in A.S.A. and ACE standards, micro and super sizes plus bushings for embedment in plastic or castable material.

Write For Catalog G

ACE DRILL BUSHING CO., INC.
3407 Fountain Ave., Los Angeles 29, Calif.

USE READER SERVICE CARD; INDICATE A-8-196-2

## HOGGSON STEEL HANDSTAMPS

for EVEN...
DEEP...
CLEANCUT...
LETTERS & FIGURES

**Sharp, clean impressions even after years of use! Hoggson Brand Letters & Figures Hand Stamps will not spall or mushroom. Available for numbering or lettering anything from pig iron to jewelry. 19 sizes in stock, from 1/32" to 1". Roman or Gothic. Letters 27 pcs. per set; figures 9 pcs. per set.**

See your distributor or send for complete catalog

**HOGGSON & PETTIS MFG. CO.**
144 Brewery Street, New Haven 7, Conn.

USE READER SERVICE CARD; INDICATE A-8-196-3

# New! *Modern* MC Collapsible Tap

Stationary and Rotary, and in five sizes ranging from $1\frac{5}{16}$" to $3\frac{1}{2}$", these New MC Taps have more new features—money saving features—than we can tell you about in this ad.

The complete story is in Bulletin M-113. It's yours for the asking. Mail this coupon today!

**modern tool works**

CONSOLIDATED MACHINE TOOL COMPANY

ROCHESTER, NEW YORK

A DIVISION OF FARREL-BIRMINGHAM COMPANY, INC.

**CONSOLIDATED MACHINE TOOL CORP.**
***MODERN TOOL WORKS DIVISION***
**565 Blossom Road, Rochester 10, N. Y.**

Please send me without obligation your new Bulletin M-113 giving full information on modern MC Collapsible Taps.

Name.....

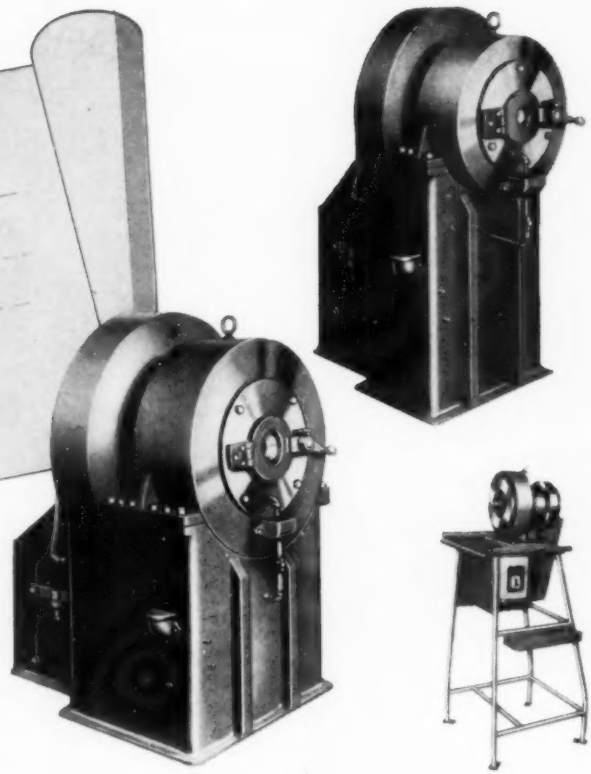
Title.....

Firm Name.....

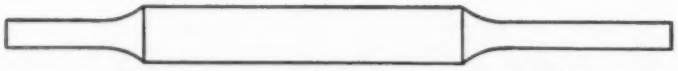
Address.....

City.....Zone.....State.....

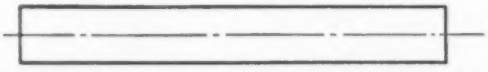
# Swaging Success Stories



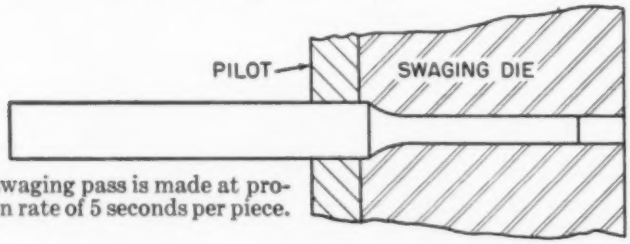
## *37% Savings in Material . . . by swaging*



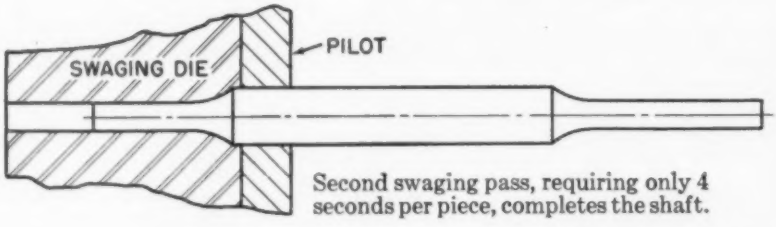
Here's a steel shaft (shown half-size) that was originally produced by turning. A switch to swaging resulted in a 37% material saving.



This is the blank for swaging. Blank for turning was same diameter—but the full length of the finished piece.




First swaging pass is made at production rate of 5 seconds per piece.




Second swaging pass, requiring only 4 seconds per piece, completes the shaft.

### Check these advantages of swaging

substantial savings in material
high burnished finish
close tolerances—accurate to ±.001
savings in labor—through higher production rate and use of unskilled labor

*Write for our informative booklet on swaging. It contains detailed descriptions of the Torrington Rotary Swagers. You may find that swaging offers important advantages over your present fabrication methods.*

THE TORRINGTON COMPANY
*Swager Department*
444 North Street, Torrington, Conn.
*Makers of Torrington Needle Bearings*

**TORRINGTON ROTARY SWAGING MACHINES**

for the really tough abrasive jobs*

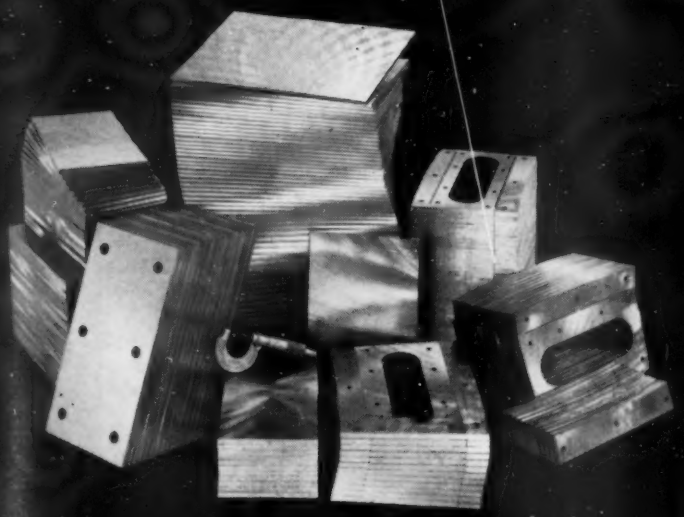
# Chromewear

U. S. Patent 2,174,285

HIGHEST ABRASION-RESISTING STEEL

Independent laboratory tests have shown that CHROMEWEAR has abrasion resistance more than 30 times that of 1% carbon tool steel and 6 times that of high carbon-high chromium tool steels. No other known steel exceeds CHROMEWEAR in this respect. Wherever maximum wear resistance is required, with machining kept to a minimum, CHROMEWEAR is your outstanding choice. Typical uses are brick mold liners, liners for sand blast machines and sand slingers, drawing dies, ceramic molds, extrusion dies for ceramics. There is a Vanadium-Alloys Steel Company office near you for consultation and the prompt handling of your inquiries.

*brick mold liners, for example



No other steel has outperformed CHROMEWEAR for brick mold liners

made by the originators of High-Vanadium Steels

VANADIUM-ALLOYS STEEL COMPANY was first to produce 18-4-1 and 18-4-2 high speed steel, first to produce M-2, M-4 (Neatro) and T-15 (Vasco Supreme) high-Vanadium high speed steels—all nationally known for first quality performance over a wide range of applications.

**VANADIUM-ALLOYS STEEL COMPAN**

*Manufacturers of First Quality Tool and Die Steels*

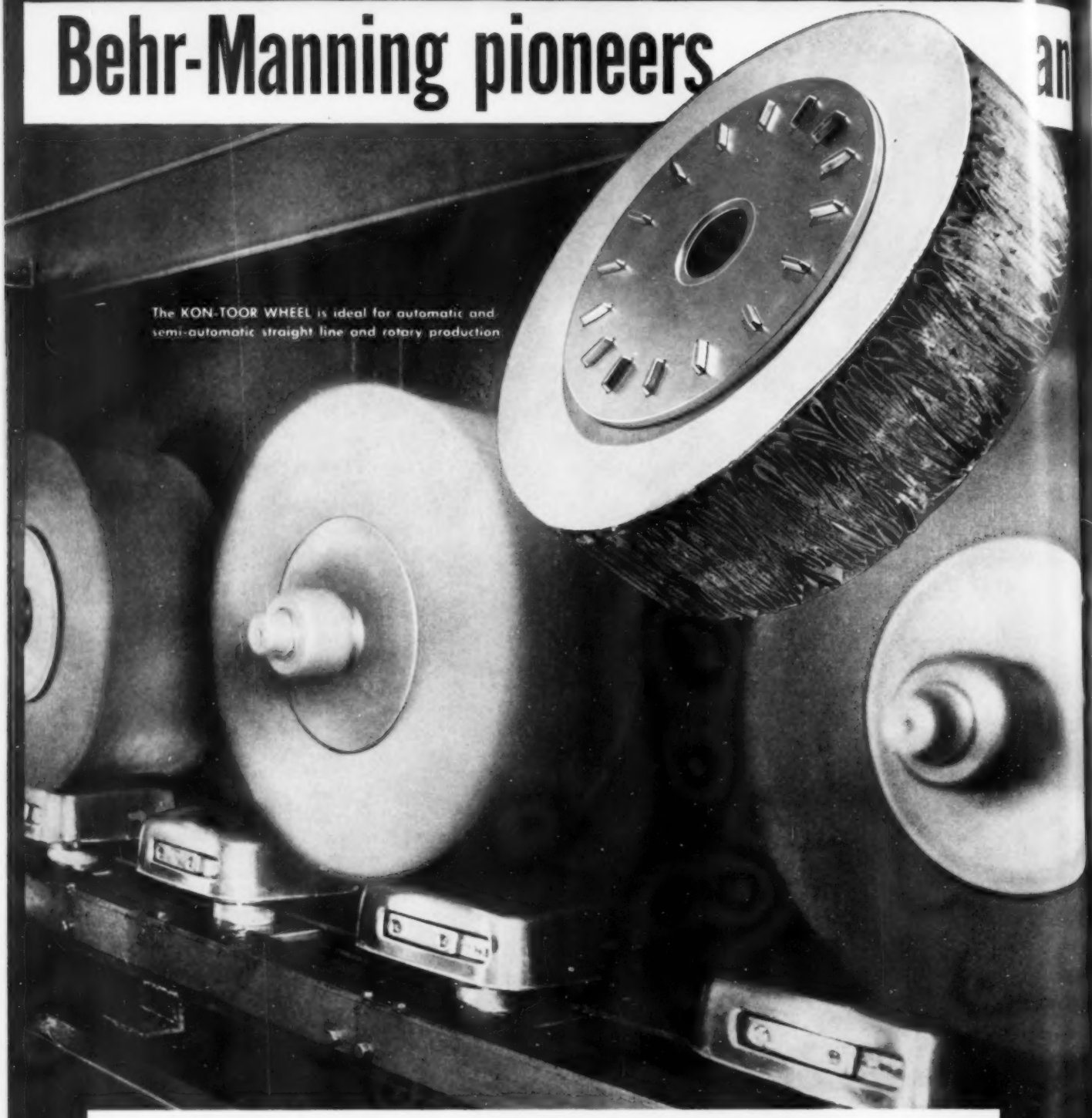
**Latrobe, Pennsylvania**

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL C

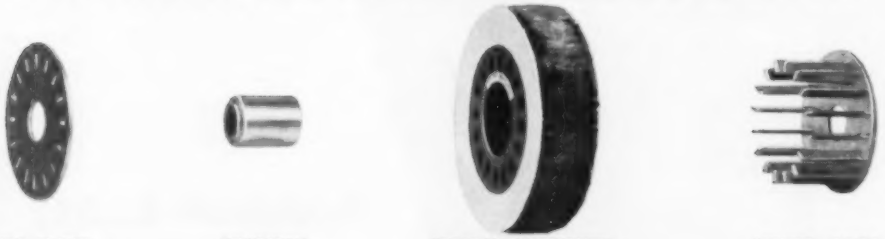
In Canada:

Vanadium-Alloys Steel Canada Limited, London, Ontario

# Behr-Manning pioneers




**AN EXPLODED VIEW OF WHEEL COMPONENTS . . .**



SIDE PLATE | BUSHING | KON-TOOR WHEEL | WHEEL CAGE

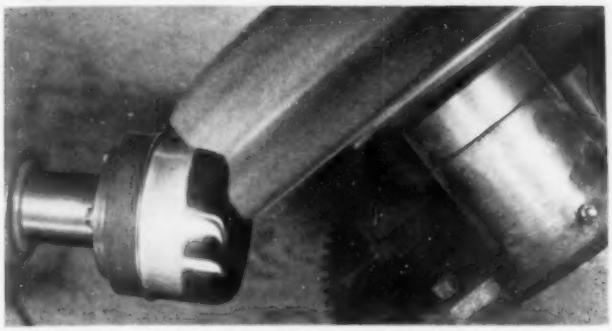
The KON-TOOR WHEEL is constructed of numerous segments of double-faced abrasives and is available in face widths 2" to 7" inclusive – Flexible or stiff construction. Multiple wheels can be used for widths over 7".

*For the newest in coated abrasives . . . watch BEHR-MANNING!*

# entirely new concept in polishing!

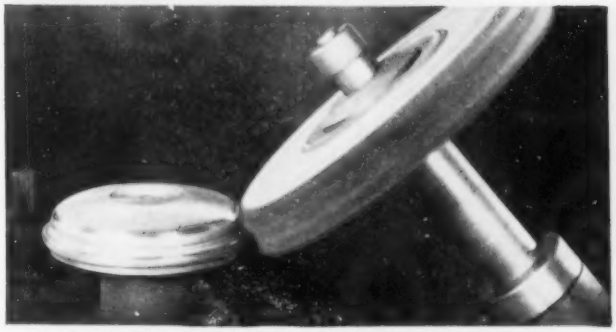
## ...the ALL coated abrasive KON-TOOR® WHEEL

### CAN BE SHAPED TO CONTOUR



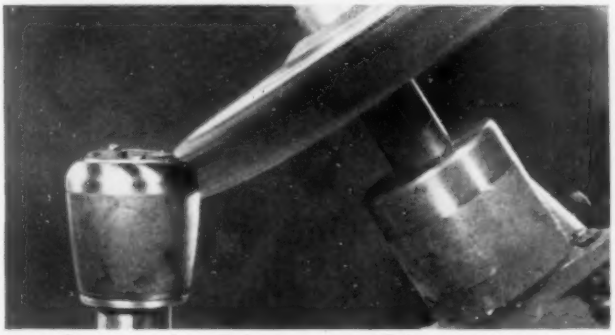
Note how the KON-TOOR WHEEL hugs the radius of this stainless steel cooking utensil.

### PRODUCES FINER FINISHES



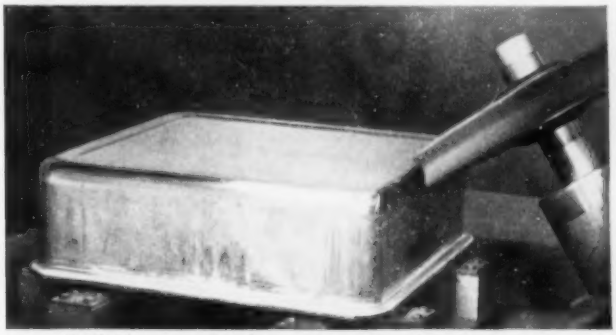
An intricate radius on a pressure cooker cover gets polished by a 2" face KON-TOOR WHEEL.

### MINIMUM LUBRICATION REQUIRED



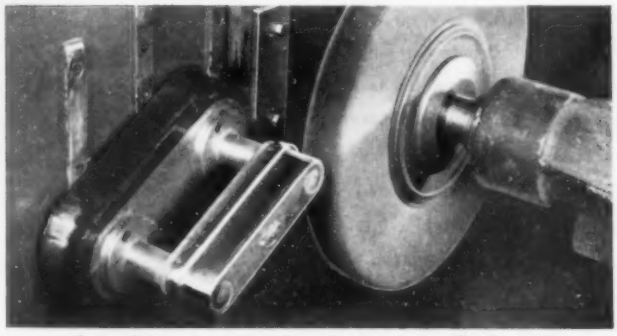
It cuts cooler all the way – A 2" face KON-TOOR WHEEL polishing a drawn steel coffee pot.

### CUTS FINISHING COSTS



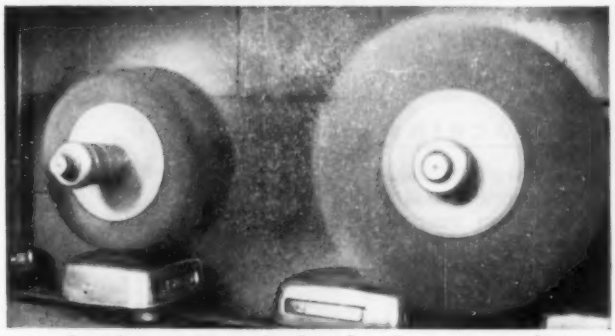
Polishing production soars with the KON-TOOR WHEEL on jobs like this aluminum stamping.

### EASY TO USE



Complicated conversion factors are eliminated. The KON-TOOR WHEEL is easily adapted to standard lathes and work-holding fixtures.

### IT'S WEARABLE TOO!!!



Stands up to production for days and weeks instead of hours – note wheel at left still producing after days on the job.

● For details, contact your local Behr-Manning Field Engineer, or write today to Behr-Manning, Troy, N.Y., Dept. TE-8.

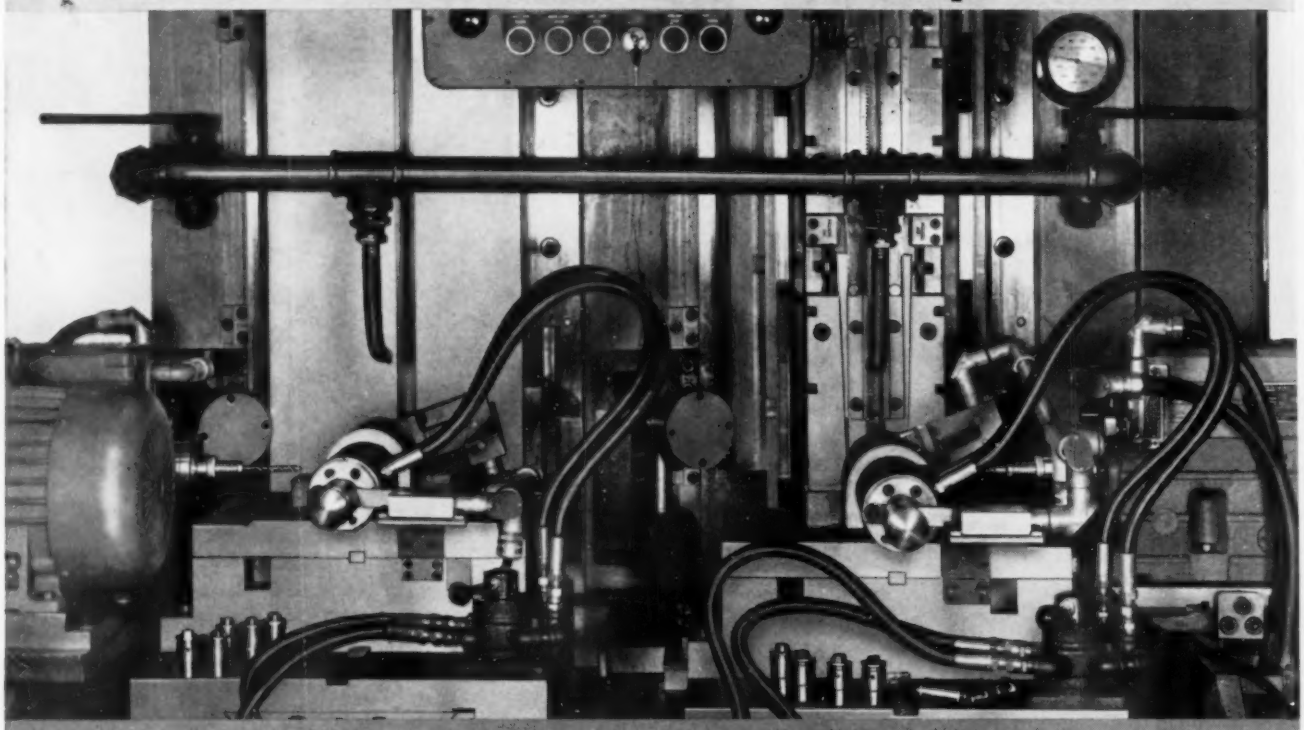
In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

BEHR-MANNING® division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

# Detroit Broach COMBINES STANDARD UNITS

## to cut labor costs and boost production



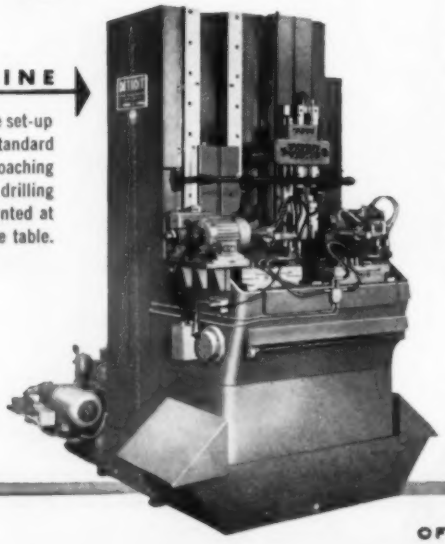
## HEX BROACHED and HOLE DRILLED IN ONE OPERATION—225 TIMES PER HOUR!

**THE PART**

A pressure regulator for automatic transmissions. Note the hex on the end and the blind hole on the side . . . both are produced in this tooling set-up.

**THE MACHINE**

A complete view of the set-up on a Detroit Broach standard 5-ton, twin ram broaching machine. The left drilling unit can be seen mounted at the side of the shuttle table.



By adding to a standard Detroit Broach surface broaching machine two standard Ex-Cell-O drilling spindles, both broaching and drilling are performed at once in this set-up, which features full interlock and is virtually foolproof. The part is held in a collet which indexes during the broaching stroke to produce the hex. At the end of the stroke, the blind hole is drilled automatically. Maintenance is extremely simple and the standard units may be used for other applications should the present operation be discontinued.

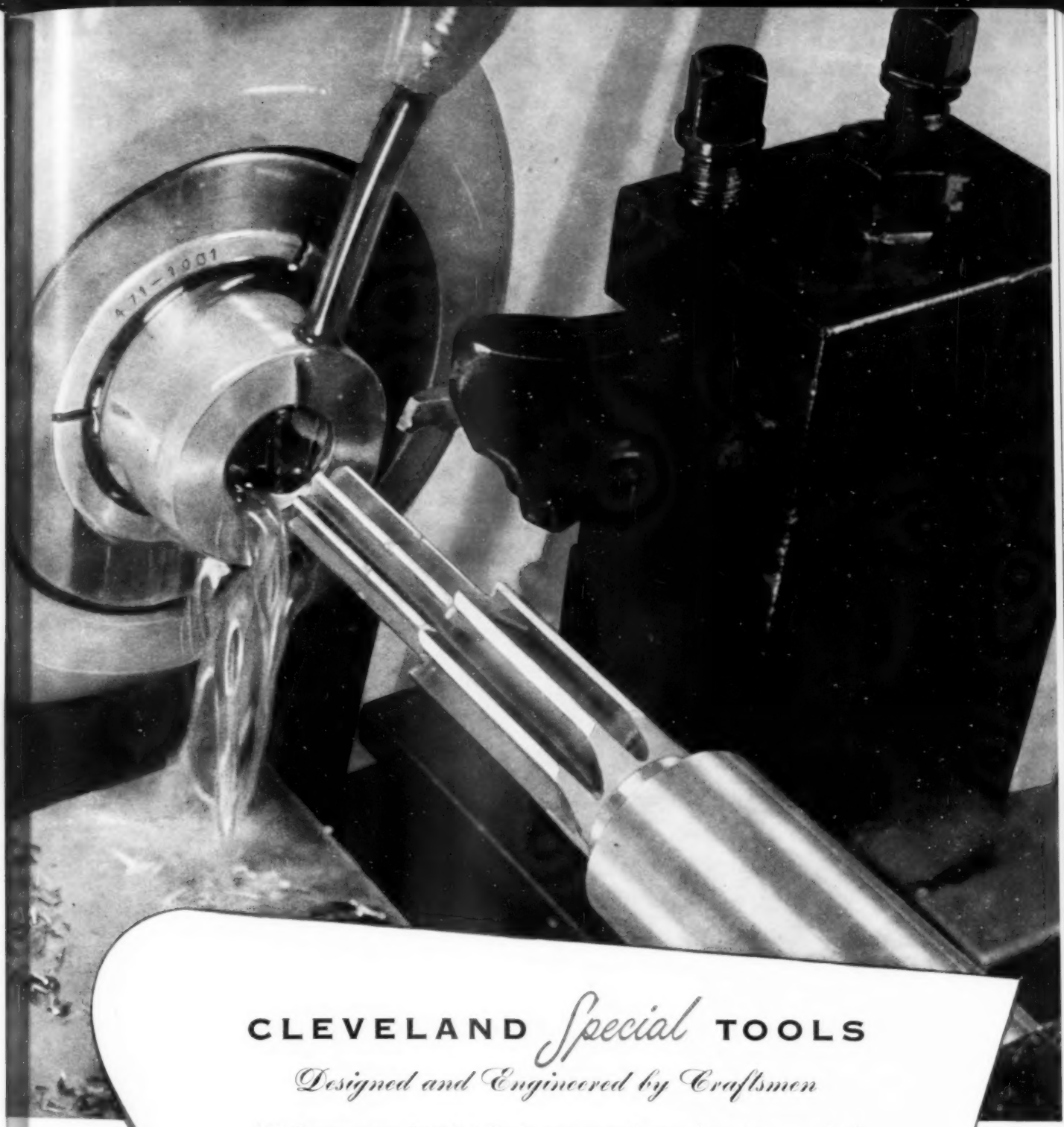
Important, too, is the fact that the hole is accurately positioned in relation to the hex. This same advantage can be applied to operations other than drilling as well.

Lowered labor costs, flexibility of set-ups and high output are keynotes of Detroit Broach engineering. In your plant, Detroit Broach can doubtless show similar savings on many of your present operations.

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



# CLEVELAND *Special* TOOLS

*Designed and Engineered by Craftsmen*

All CLEVELAND Special Tools are manufactured to the same high standards of quality as regular tools bearing the famous ◈ trademark. Why not take advantage of CLEVELAND's experience, "know-how" and service in designing, producing and testing special Drills, Reamers, End Mills or other tools for your next job?

**THE CLEVELAND TWIST DRILL CO.**

1242 East 49th Street • Cleveland 14, Ohio

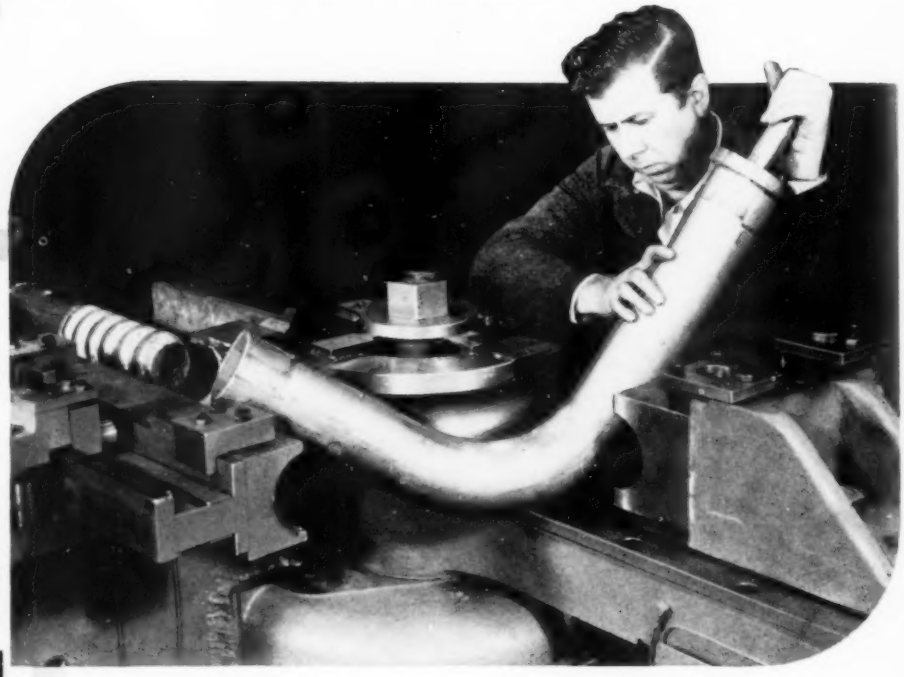
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

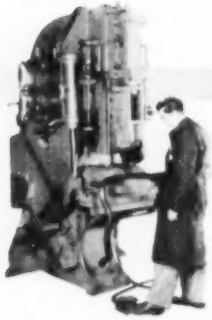
TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

# 4 COST-CUTTING SOLUTIONS

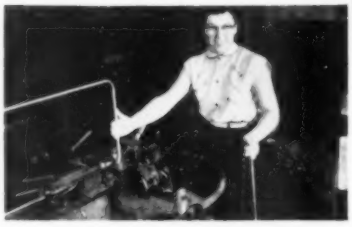
## FOR FABRICATORS OF TUBING, PIPE, MOLDINGS AND EXTRUDED SHAPES



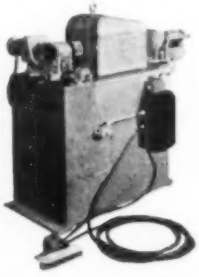
PINES SIZE 4 BENDER — Now cold forms ultra-thin 4" x .020" stainless steel tubes for aircraft to 8" c/l radius. Ability to form these sharp, small radius bends without wrinkles saved $14,000 per plane for an aircraft manufacturer.



PINES 20-TON BENDING PRESS — Speeds production of automotive tail pipes, completes some jobs 50% faster by eliminating work handling. Up to 10 bends produced in a single progressive operation, most jobs completed in one handling.



PINES SEMI-AUTOMATIC BENDER — Capacity up to 300 bends per hour, for applications where output does not require speed of fully automatic machines. Hydraulic power assures accurate, highly uniform results. Economically tooled, easy for women to operate, requires up to 60% less floor space.



PINES END-FINISHING MACHINE — 3" capacity, floor-mounted unit with air clamping. Speeds deburring, facing, pointing, or light hollow mill turning. Available with manual or air spindle advance. Other units also provided for smaller and larger work.

● Since 1941, when Pines Automatic Hydraulic Bending Machines were first introduced, more and more plants fabricating tubing, pipe, rods, moldings, rolled and extruded shapes, have found it profitable to standardize on Pines Machines. Dependable accuracy, combined with fast, more efficient operation are two of the major reasons why hundreds of commercial and industrial plants have turned to Pines to find cost-cutting solutions to bending and end-finishing problems. A study of the four examples shown here may suggest how you may profitably take advantage of the latest developments in fabricating the "Pines-way".

**WRITE FOR *Free* DATA SHEETS**

For additional cost-cutting ideas, write today for free copies of "Pines News"—illustrates latest bending and end-finishing techniques applied to actual jobs. And call on Pines engineers for assistance on any job.

**PINES ENGINEERING CO., INC.**

Specialists in Tube Fabricating Machinery | 693 WALNUT • AURORA, ILLINOIS

**PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY**

the NEW

# HPM C Hydraulic PRESS

## Check These Important Features

- Six Automatics — Two Manuals
  2 to 200 ton capacity
- Roomy C-Type Frame
  High, wide and plenty of room for tooling
- Sturdy, Enclosed Frame Design
  Reservoir in base
- Tonnage, Ram Stroke, Ram Speed
  Completely adjustable
- Optional Controls
  Improved features
- Index Tables, Hydraulic Knockouts
  and other production accessories
- A size for Every Job

## The Most Complete Line of C-Frame Presses in the 2-200 Ton Range

The H-P-M C-Press will provide a fast answer to a variety of problems in your automation program. Simplified operating principles make the C-Press your best bet for low-cost pressure processing. You've speed, power and unlimited versatility — production tooling accessories, too, for added productivity. Write for the new, completely illustrated catalog, today.

*For Every Pressure Processing Need*

**THE HYDRAULIC PRESS MFG. COMPANY**

*Mount Gilead, Ohio, U.S.A.*

**2004 MARION ROAD**

HPM



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-205

# What's Taft-Peirce Featuring

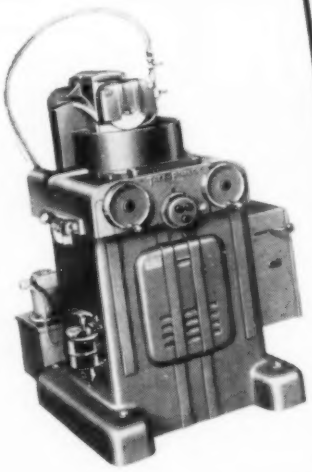
## MACHINE TOOLS

**T-P NO. 1 SURFACE GRINDER**

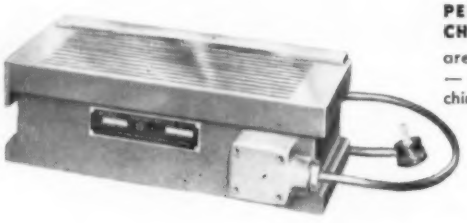
A simple spark test demonstrates how this extraordinary surface grinder repeats to .00005". Gives finishes so smooth in many cases they seal without lapping.

**T-P 6" ROTARY SURFACE GRINDER**

Repeats to .00005". Wheelhead tilts up to 30 degrees; work spindle and magnetic chuck tilt 7½ degrees. Adapters for sharpening Fellows Gear Shaper Cutters are available.



## MAGNETIC CHUCKS

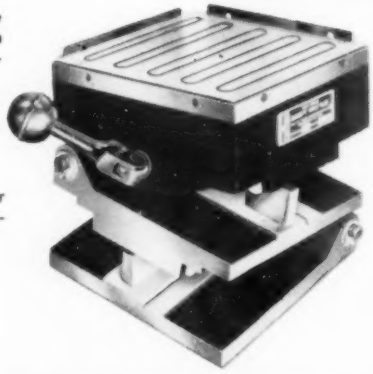


**T-P SUPERPOWER MAGNETIC CHUCKS**

Taft-Peirce offers a complete line of work-designed chucks with maximum power and dependability.

**T-P SUPERPOWER PERMANENT MAGNET CHUCKS**

are longer, stronger, 20% lower — give greater clearance on machine tool tables.



## AIR GAGES

**T-P COMPUTING COMPAIRATOR AIR GAGES**

Utilizing the more versatile, more dependable circuit of T-P standard air gages, a Computing CompAIRator solves simple problems — simplifies many complex measurements.

**T-P AIR-ELECTRIC COMPAIRATOR AIR GAGES**

speed multiple inspection jobs. Lights flash to indicate out-size dimensions. Dials give exact size.

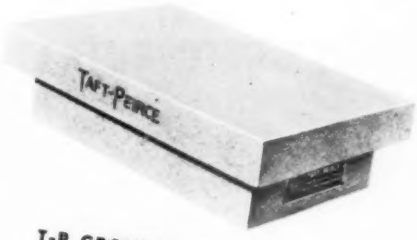
# at the Machine Tool Show

## FIXED GAGES

**T-P ROTOCHEK**
cuts thread gaging time by ⅔. Push — and gage screws into work. Pull — and it disengages.

**T-P PLUG, RING, SNAP GAGES**
Taft-Peirce offers hundreds of different fixed gages, standard or special. One for every gaging job.

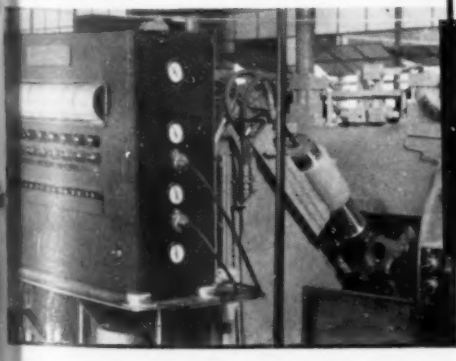
## TOOL ROOM EQUIPMENT




**T-P GRANITE SURFACE PLATES**
offer maximum accuracy with longer life. Cast Iron Plates and stands also available.

**T-P ANGLE IRONS AND SINE CHECKING EQUIPMENT**
are just some of the many time-and-labor-saving devices that will be exhibited at the Show.

**T-P AUTOMATIC COMPAIRATOR AIR GAGES**
make 100% quality control possible in mass production. Automatically inspects, rejects out-size parts.



**See them in action at the Show Booth 811**

**THE TAFT-PEIRCE MANUFACTURING COMPANY**

T-P means Top Precision

**WOONSOCKET, RHODE ISLAND**



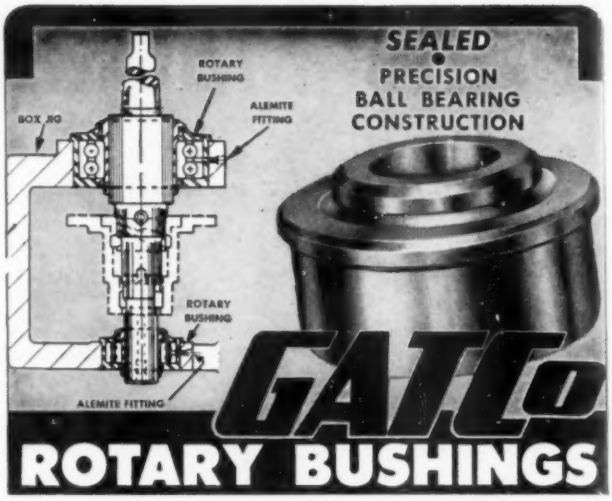
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-207

# BAY STATE TAPS

**PRECISION PERFORMANCE**

of Bay State Taps means precision threads on a production basis. Made in all standard and special sizes, these taps are available from your nearby industrial supply distributor. Gain precision performance on every tapping job with controlled contour taps . . . made by BAY STATE TAP & DIE CO., MANSFIELD, MASS.

USE READER SERVICE CARD; INDICATE A-8-208-1




***FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING***

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

*Write for full information and prices*

**GATCO ROTARY BUSHING CO.**

42324 ANN ARBOR ROAD, U.S. 12, PLYMOUTH, MICH.

*Telephone* PLYMOUTH 1472

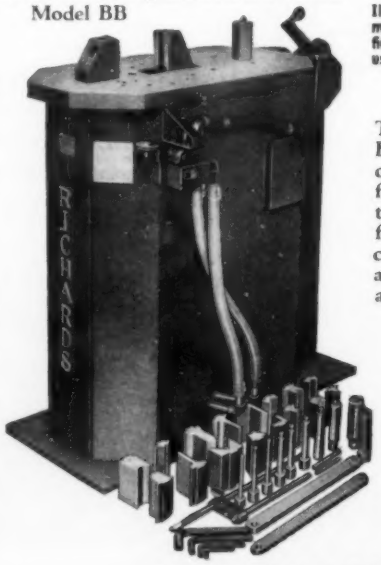
USE READER SERVICE CARD; INDICATE A-8-208-2

Multiform

## BIG BROTHER BENDER

**Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses**

Model BB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra.

Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material. These machines are solving new forming problems in many plants and could be the answer to yours.

***Send for illustrated folder TE-5***

903 North Pitcher St.
Kalamazoo, Michigan

**J. A. RICHARDS CO.**

USE READER SERVICE CARD; INDICATE A-8-208-3

*Controlled* compressed air has given Industry muscle-saving power to produce more . . . economically . . . without fatigue . . . more safely.

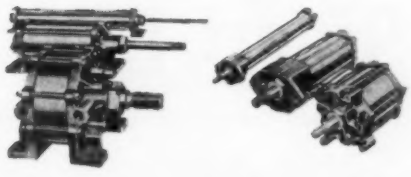
Compressed air has become a must in every plant. If you are not now using it, investigate it. And—wherever you actually use compressed air—you'll make its use more effective if you use the best valves possible—Schrader Valves. They are designed and built by a company whose success dates back to 1844—more than a century of experience in air control.

In the complete line of Schrader Valves you'll find two-, three- and four-way models . . . for hand, foot, cam, pilot or solenoid operation . . . for practically any application.

Find out how Schrader Valves can put compressed air to work to save you money. For specification data, write—or, if you prefer, fill out the coupon below.

**Schrader**
REG. U. S. PAT. OFF.

**LEADERS IN AIR CONTROL SINCE 1844**



The complete Schrader line of pneumatic accessories includes everything you need

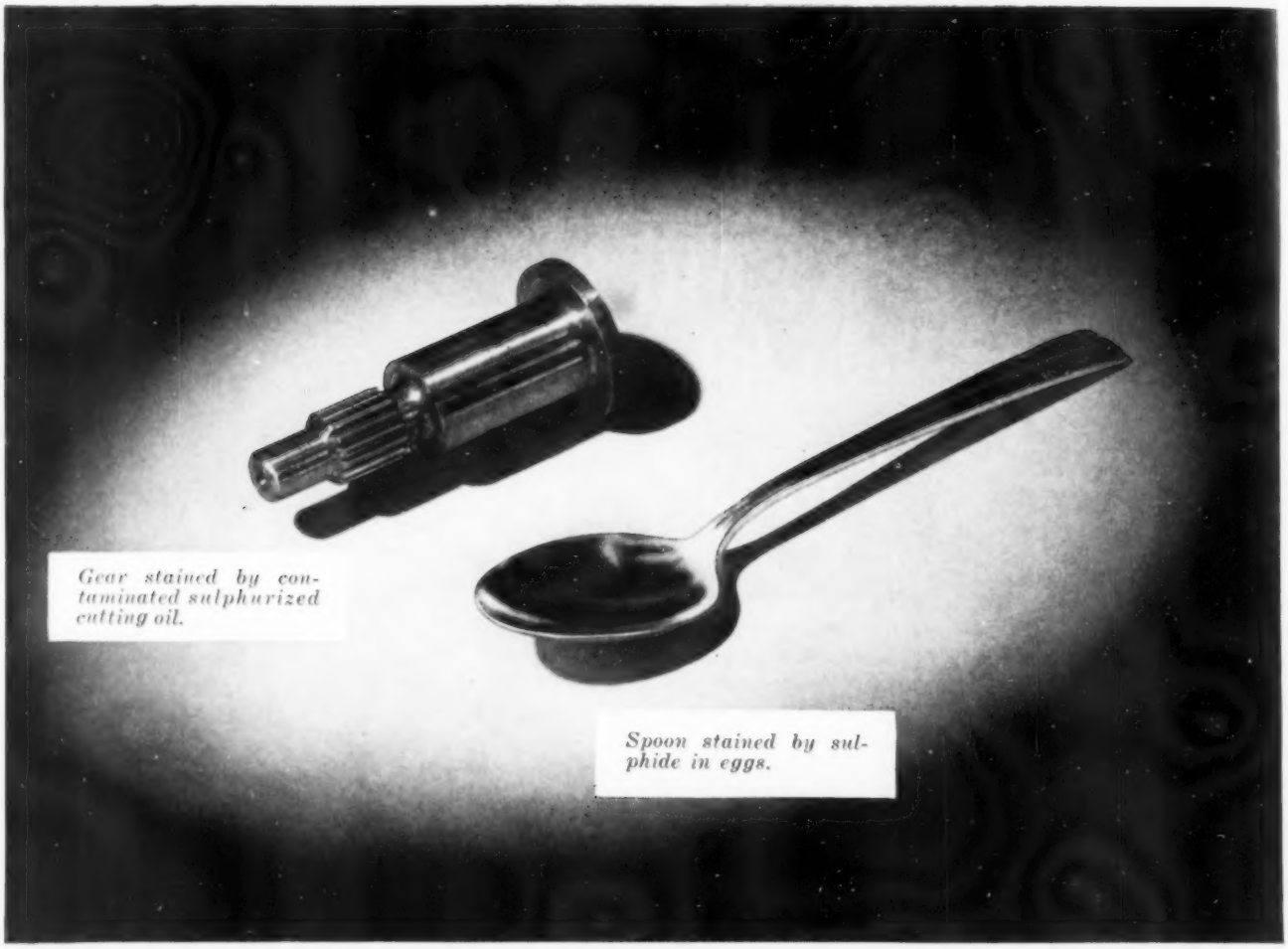
**A. SCHRADER'S SON**
Division of Scovill Manufacturing Company, Incorporated
**462 Vanderbilt Avenue, Dept. I-8**

I am interested in more information on_____

Name_____ Title_____

Company_____

Address_____



*Gear stained by contaminated sulphurized cutting oil.*

*Spoon stained by sulphide in eggs.*

# Sulphur Staining on Ferrous Parts is Harmless

Staining of machined ferrous parts caused by cutting fluids containing active sulphur is similar to the stains you find on your silverware. It has no adverse effects whatsoever on the finish, or characteristics of the metal. *It is not corrosion*, and according to automotive and military authorities, in no way affects service life.

Experience has proved that cutting fluids containing active sulphur provide far better performance when machining the tougher steels. Staining can only occur during very humid conditions or when water is allowed to contaminate the sulphurized cutting oil. A sample piece of metal will not stain in a cutting fluid free of water . . . but often it will the moment moisture is added.

The *important* factors to consider when selecting a cutting fluid are surface finish, production and tool life. Here is where a cutting fluid pays for itself. Ask to have "the Man in the Barrel", your Stuart Representative, help select that Stuart Oil that will produce the very best results under the conditions you will subject it to.

Further information on sulphur staining is provided in the D. A. Stuart Shop Note Book, Bulletin S-1. Write for your copy.

**D.A. STUART OIL COMPANY, LTD.**
2727-49 S. Troy St., Chicago 23, Ill.

**More than a "Coolant" is Needed**

**Stuart Oils**

*Time Tested Cutting Fluids and Lubricants*

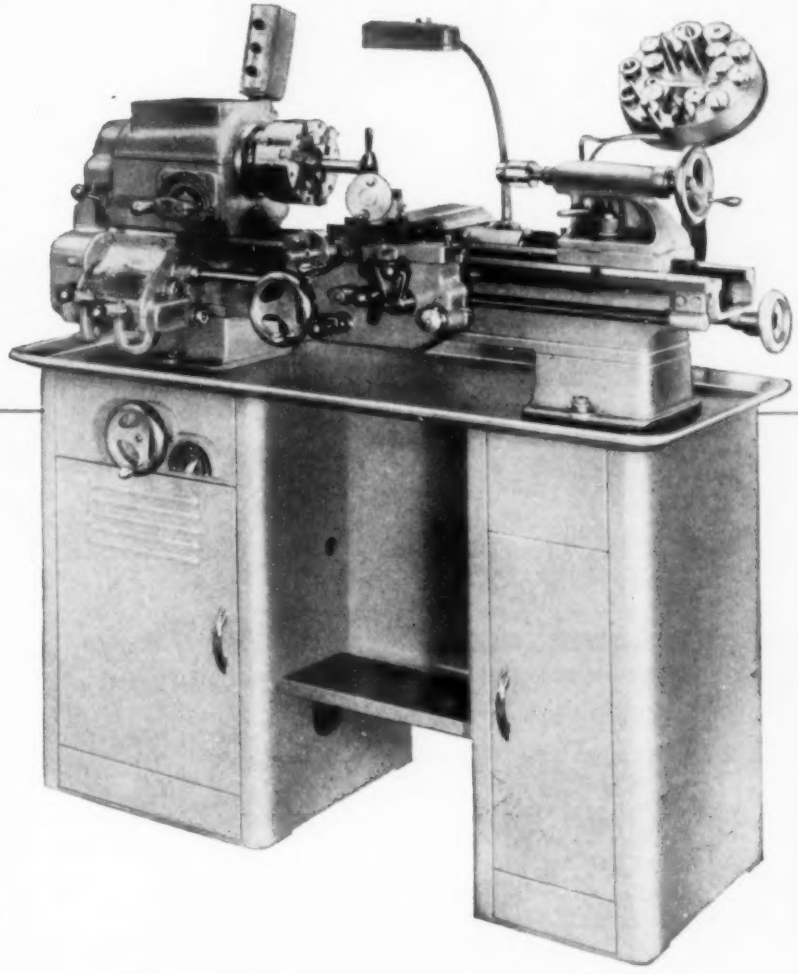
*Plants in:* Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

# *New* DELTA Metal Cutting Lathe

## The Finest 11" Metal Cutting Lathe At Any Price!

No other 11" metal cutting lathe, *regardless of price*, brings you all the precision, safety, and convenience of this great new Delta 11" Metal Cutting Lathe! A product of 5 years research and testing, this newest Delta Metalworking Machine offers you lathe features you've always wanted, but have never been able to get.



**COMPARE IT WITH ANY OTHER 11" METAL CUTTING LATHE FOR FEATURES LIKE THESE . . .**

### EXCLUSIVE DRIVE SELECTOR

Only Delta lets you select every drive position—loose spindle, locked spindle, direct drive or gear drive—*simply by moving one lever.*

### CHOICE OF SPINDLE NOSES

Only Delta gives you choice of L-00 Tapered Key Drive or conventional 2¼"—8 Threaded Spindle Nose *at no extra cost.*

### PERFECTED VARIABLE-SPEED DRIVE

Only Delta gives you all the advantages of a variable-speed drive, with an infinite choice of speeds from 45 to 1550 rpm—PLUS the high torque transmitting power of matched V-belts.

## *See This Great New Lathe*

at your Delta Dealers *now!* He's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY." Send the coupon *today* for full catalog data.

**DELTA** QUALITY POWER TOOLS

Another Product by **Rockwell**

DELTA ROCKWELL

ROCKWELL

*DELTA QUALITY COSTS NO MORE*

Delta Power Tool Division, Rockwell Manufacturing Company
620-H North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send catalog on new Delta 11" Metal Cutting Lathe.

☐ Please send name of my nearest Delta Dealer who has the new Delta 11" Metal Cutting Lathe on display.

Name_____ Title_____

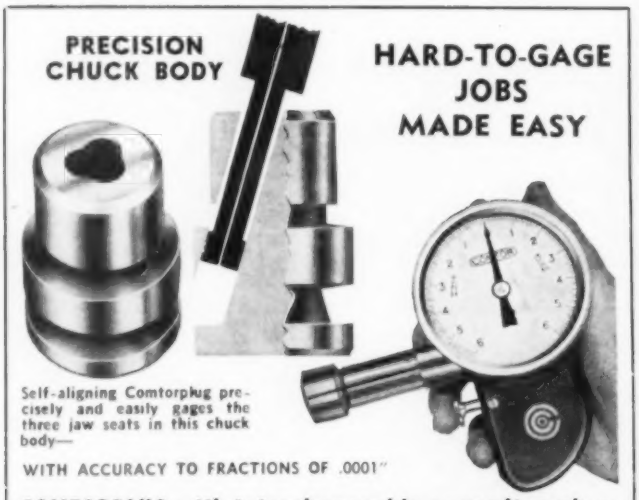
Company_____

Address_____

City_____ County_____ State_____

PRECISION CHUCK BODY

HARD-TO-GAGE JOBS MADE EASY



Self-aligning Comtorplug precisely and easily gages the three jaw seats in this chuck body—

WITH ACCURACY TO FRACTIONS OF .0001"

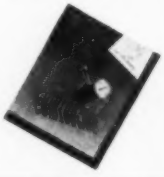
**COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.**

**Unique Advantages**

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

COMTOR COMPANY
69 Farwell St.
WALTHAM 54, MASS.



*GET THE FACTS—REQUEST BULLETIN 48*

USE READER SERVICE CARD; INDICATE A-8-212-1

ELGIN

**GOLDEN-CIRCLE ROTARY TOOLS**

backed by ELGIN'S reputation for quality leadership

Here is a new performance-tested line . . . burs and rotary files, carbide or high-speed steel, shapes and sizes to meet every need. They're precision-made and proudly marked with the Golden-Circle, symbol of dependable ELGIN quality. Write for your copy of the "Golden Circle" booklet today!

FREE BOOKLET

. . . see how many operations can be made easier and faster. See how many shapes and sizes are made to meet your need.

ABRASIVES DIVISION, DEPT. S

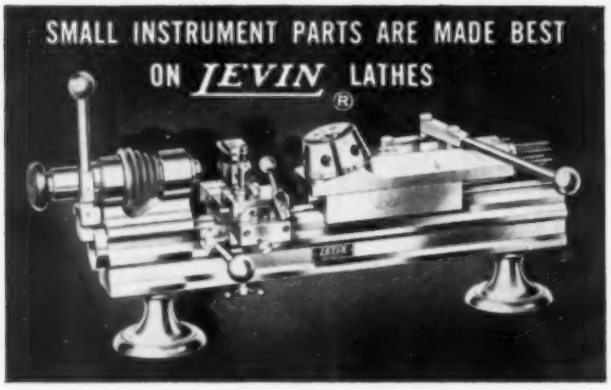
ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

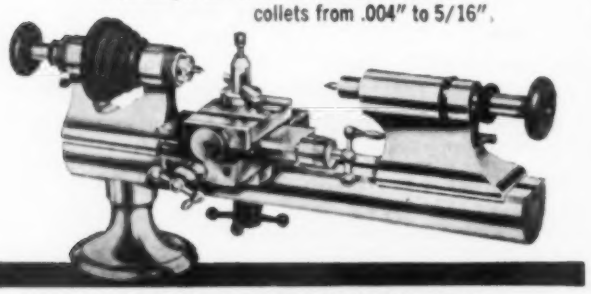
USE READER SERVICE CARD; INDICATE A-8-212-3



SMALL INSTRUMENT PARTS ARE MADE BEST ON *LEVIN* LATHES



Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



Send for Catalog M describing Lathes for tool work, second operations; turrets and full line of accessories.

LOUIS LEVIN & SON, INC., 3610 S. Broadway, Los Angeles 7, Calif.

USE READER SERVICE CARD; INDICATE A-8-212-2



*HERE'S* **Tool-flex**

NEOPRENE MOUNTED FLOATING TOOL HOLDERS

**SELF-CENTERING**
(ELIMINATES COSTLY SET-UP)

**FULL-FLOATING**
(COMPENSATES FOR BOTH PARALLEL AND ANGULAR MISALIGNMENT)

**POSITIVE DRIVE**

**OIL-RESISTANT NEOPRENE MOUNTING**

**REDUCES TOOL BREAKAGE**

**SIMPLE CONSTRUCTION**
(ONLY FOUR MAIN PARTS)

***Tool-flex***
**MADE IN ANY STYLE SHANK OR COLLET**

*Write for information... Dealer inquiries invited*

BURG TOOL MANUFACTURING CO. Dept. TE-2

15001 So. Figueroa St. • Gardena, Calif.

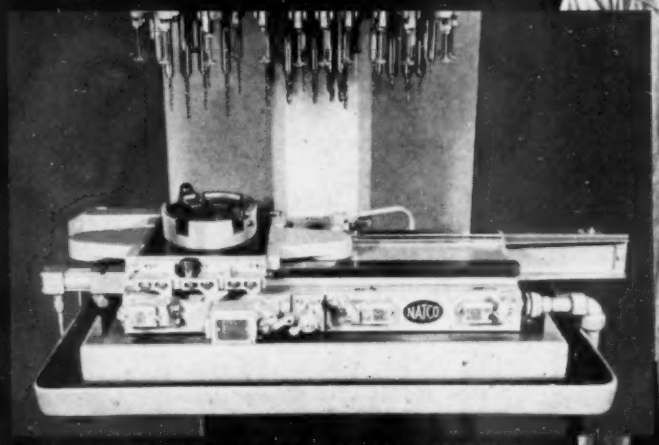
USE READER SERVICE CARD; INDICATE A-8-212-4

# NEW NATCO DRILLER DOES WORK OF THREE MACHINES

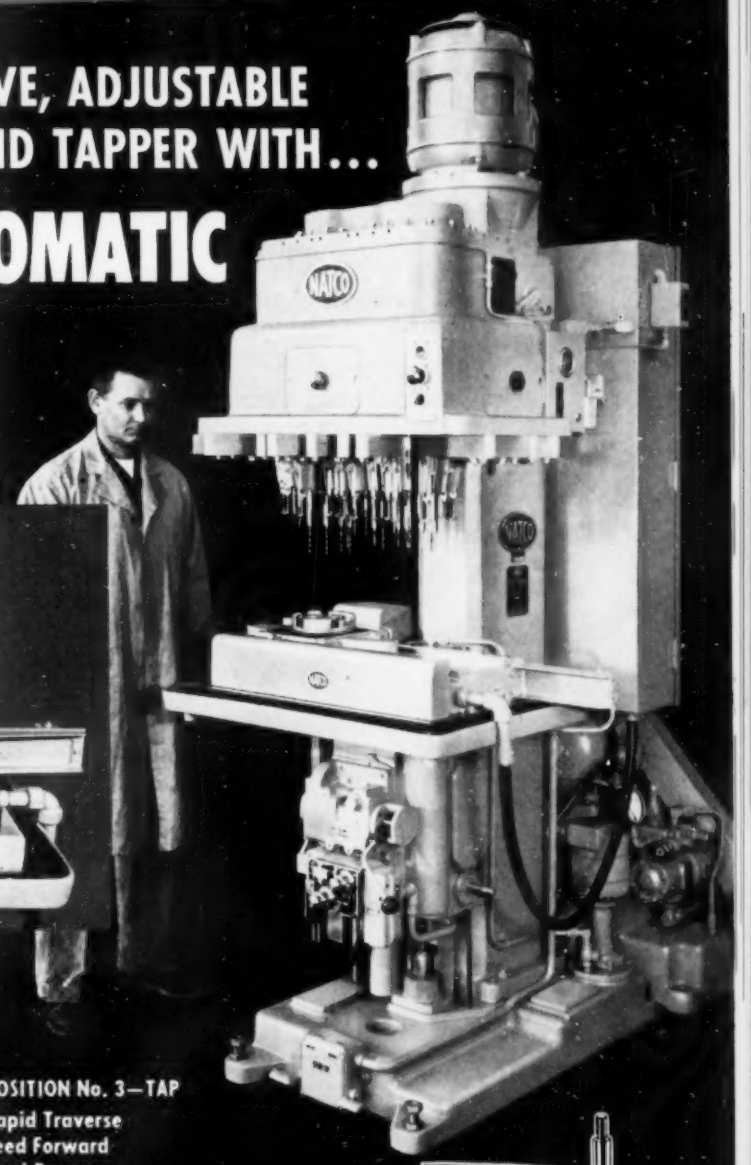
## ...DRILLS, CHAMFERS AND TAPS AUTOMATICALLY!

### NATCO H-6 LIGHT SENSITIVE, ADJUSTABLE MULTI-SPINDLE DRILLER AND TAPPER WITH...

## 3 POSITION AUTOMATIC FIXTURE SLIDE



THREE POSITION AUTOMATIC FIXTURE SLIDE IN DRILL POSITION.

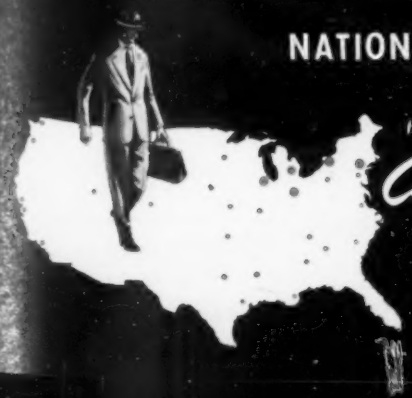


### TYPICAL FEED CYCLE

| POSITION No. 1—DRILL | POSITION No. 2—CHAMFER | POSITION No. 3—TAP |
|---|---|---|
| Load Part | Rapid Traverse | Rapid Traverse |
| Rapid Traverse | Feed Forward | Feed Forward |
| Feed Forward | Rapid Reverse | Feed Reverse |
| Rapid Reverse | Index to Position No. 3 | Rapid Reverse |
| Index to Position No. 2 | | Index to Position No. 1 |

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

MTS



## NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA

*for answers to your Drilling, Boring, Facing and Tapping problems*

*Call a Natco Field Engineer*

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

NATCO

## Here's the best shortcut in the field of organic finishing

One operation usually removes paint, rust and oil at the same time.

One tank of Oakite Rustripper frequently does all these jobs: (1) strip rejects and conveyor hooks; (2) pickle rusted stock; (3) prepare reconditioned products for refinishing operations.

One tank may eliminate many tanks used in ordinary cycles.

STRIP
RINSE
PICKLE
RINSE
NEUTRALIZE
RINSE

OAKITE RUSTRIPPER

RINSE

PREPAINT → DRY → PAINT

**FREE** Our illustrated booklet tells how this amazing cleaner - stripper - deruster offers tremendous possibilities for saving minutes, hours, dimes, dollars. Write or send coupon for your copy.

## Here's the best shortcut in the field of electroplating

One operation usually removes rust and oil at the same time. One alkaline tank may remove oxides, drawing compound residues and other stubborn soils . . . even strip zinc and cadmium from rejects and racks.

Sensational Oakite Rustripper frequently eliminates acid pickling and its troublesome after-effects: (1) hydrogen embrittlement; and (2) smut that must be removed by electrocleaning or hand brushing.

ALKALINE CLEAN
RINSE
PICKLE
RINSE
ELECTROCLEAN
RINSE

OAKITE RUSTRIPPER

RINSE

ELECTROPLATE ← RINSE ← CYANIDE or ACID DIP

**FREE** Our illustrated booklet tells how this shortcut may save you time and money—in tank lines, in automatic platers, in barrel lines—by saving equipment, floor space, acids, water, steam and electricity. Write or send coupon for your copy.

**At The Production Engineering Show**
**Visit Oakite Booth No. 652**

Technical Service Representatives in Principal Cities of U. S. and Canada

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE · SCIENCE

**OAKITE PRODUCTS, INC.**
**54C Rector St., New York 6, N. Y.**

Send me a free copy of the booklet checked:

☐ *"Here's the best shortcut in the field of organic finishing"*
☐ *"Here's the best shortcut in the field of electroplating"*

NAME_____

COMPANY_____

ADDRESS_____

PRECISION DOWEL PINS (Standard or Oversize)

DIE SPRINGS (3 Pressure Ranges)

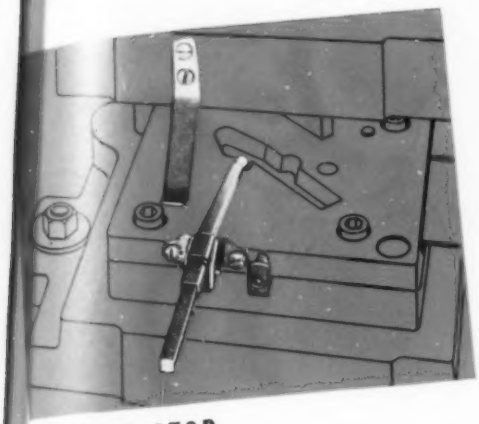
SOCKET, BUTTON OR FLAT HEAD CAP SCREWS

STRIPPER BOLTS

GUIDE POSTS

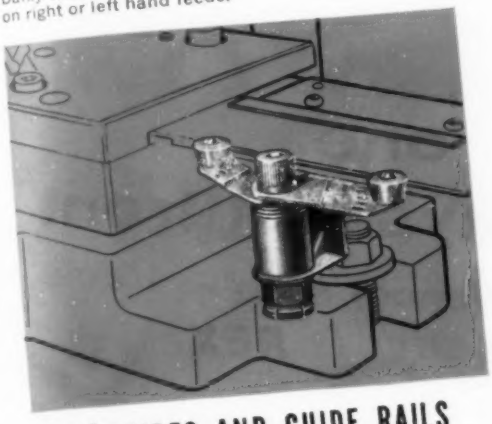
BUSHINGS

TOGGLE CLAMPS



## NEW DIE STOP

Built for dependable action, Danly primary and universal automatic stops can be ordered direct from Danly stock. Simple to attach, they can be mounted on right or left hand feeds.



## NEW GUIDES AND GUIDE RAILS

Low cost, rugged, easy to install, this new addition to the Danly line is used on dies or in any operation where coil and strip stock must be guided. Hardened parts assure long wear. Packaged complete with mounting screws and dowels.

# ...look over this broad line and see why DANLY is your best source for diemaker's supplies

Danly's original and most complete line of diemakers' supplies has now been expanded to include the new items being called for by the tool, gage, and die making industry. All items in the line are manufactured to close tolerances and exacting performance standards in sizes to meet your needs . . . all are quickly available from stock at your Danly branch, or through leading industrial distributors everywhere. For complete fast service, for dependable parts, call Danly.

DRY SEAL PIPE PLUGS

AUTO-GAGES

PUNCH SHANKS

PI BA

## HERE ARE THE DANLY PLANTS THAT SERVE YOU

**BUFFALO 7**
1807 Elmwood Avenue

**CHICAGO 50**
2100 S. Laramie Avenue

**CLEVELAND 14**
1550 East 33rd Street

**DAYTON 7**
3196 Delphos Avenue

**DETROIT 16**
1549 Temple Avenue

**GRAND RAPIDS**
113 Michigan Street, N.W

**INDIANAPOLIS 4**
5 West 10th Street

**LONG ISLAND CITY 1**
47-28 37th Street

**LOS ANGELES 54**
Ducommun Metals & Supply Co.,
4890 South Alameda

**MILWAUKEE 2**
111 E. Wisconsin Avenue

**PHILADELPHIA 40**
511 W. Courtland Street

**ROCHESTER 6**
33 Rutter Street

**ST. LOUIS 8**
3740 Washington Blvd.

**SYRACUSE 4**
2005 West Genesee Street

## NEW PACKAGING!

For your convenience, new reinforced containers facilitate stocking. No more loose or bulk storage. Color keyed, easy to read labels help you identify contents.

**DANLY . . . the complete line for tool, gage, and diemakers' supplies . . . stocked by leading industrial distributors everywhere**

DANLY®

DIE SETS AND DIEMAKERS' SUPPLIES

HOLLOW SET SCREWS

**DANLY MACHINE SPECIALTIES, INC.**
2100 South Laramie Avenue, Chicago 50, Illinois

# one is always out front

## ...and with high speed steels the pace setter is REX

Crucible's REX high speed steels have been way out in front ever since their introduction. And today they're still the *standard for comparison* wherever high speed steels are used.

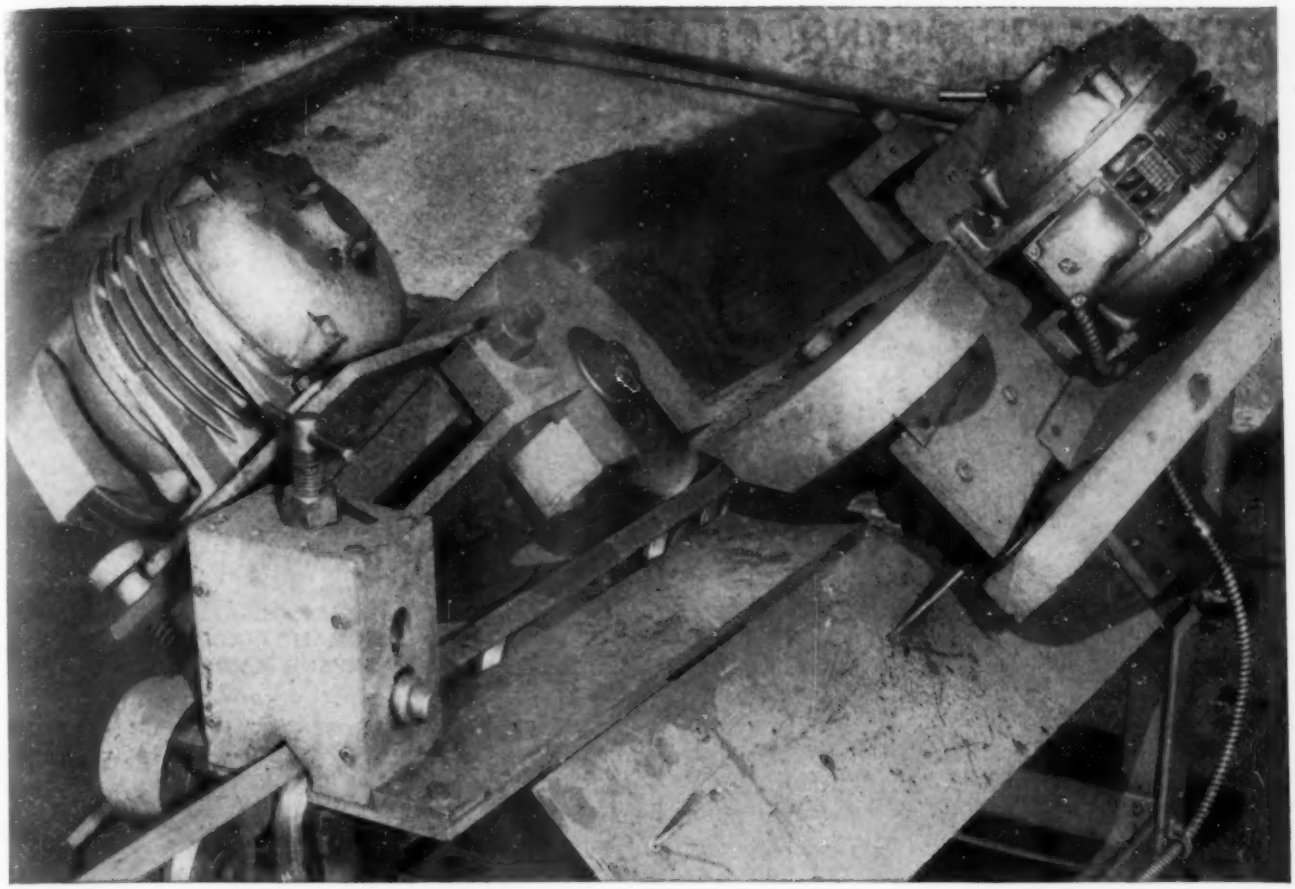
There are many good reasons for REX's leadership – uniformity of size, structure, finish, response to heat treatment, tool performance. Each factor can be proved in your own shop, on your own work. So try this *standard for comparison* on a few jobs and you'll agree with thousands of users – *you can't find a high speed steel to outperform REX.*

Because of its extensive, nationwide use, REX high speed steel is carried in stock by the coast-to-coast chain of Crucible warehouses, or is available on quick mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

Visit us at Booths 830-832 Production Engineering Show, September 6-16, Navy Pier, Chicago.

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**



# FAST PASS STRIPS SCALE

## to save money on material!

*A cost-reducing idea an OBA can duplicate in your plant*

This manufacturer takes advantage of a price differential by buying a grade of angle iron that still has mill scale on it.

**The Problem:** How to remove this hard scale and still save money over purchasing a more costly grade of steel that has been pickled.

**Here's what they do:** The angle iron bars are fed through a simple brushing machine against two Osborn Master® Wheel power brushes. In one pass, these Osborn Brushes effectively remove the hard, flint-like scale . . . at a rate of 150 feet a minute.

The strips come clean, ready for production.

You benefit many ways by having an **O**sborn **B**rushing **A**nalysis made of your cleaning and finishing operations. You can improve the quality of your product, automate your methods and cut manufacturing costs. Write us about an **OBA.** *The Osborn Manufacturing Company, Dept. K-16, 5401 Hamilton Ave., Cleveland 14, Ohio.*

BEFORE BRUSHING
Steel strips are covered with hard mill scale.
AFTER BRUSHING
Scale is gone. Surface is clean, ready for use.

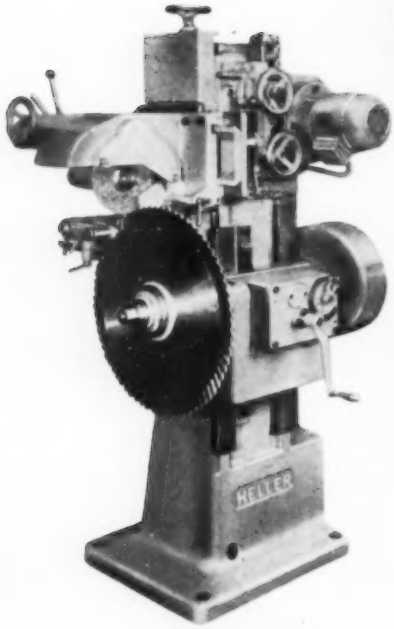
Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

# CENTRALIZE RESPONSIBILITY IN YOUR COLD SAWING *with* HELLER

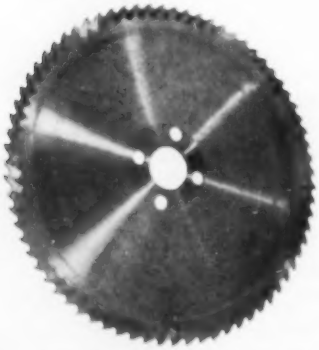
MODEL SSH-630-A
AUTOMATIC COLD METAL
SAWING MACHINE




MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

**CENTRALIZED RESPONSIBILITY**
***assures***
**TRIPLE ECONOMY**
***with* HELLER**

1. **The Cold Sawing Machine**
2. **The Blade Sharpener**
3. **The Circular Sawblade**



HELLER GIVES YOU COMPLETE SERVICE
WITH EXACTLY CORRECT BLADES.

Economies are effected on every operation involved in cold metal sawing by taking advantage of the complete service available through Heller.

The specific savings offered by use of the combination of Heller Cold Metal Saws, Heller Blade Sharpeners and recommended Sawblades becomes accumulative when used with each other.

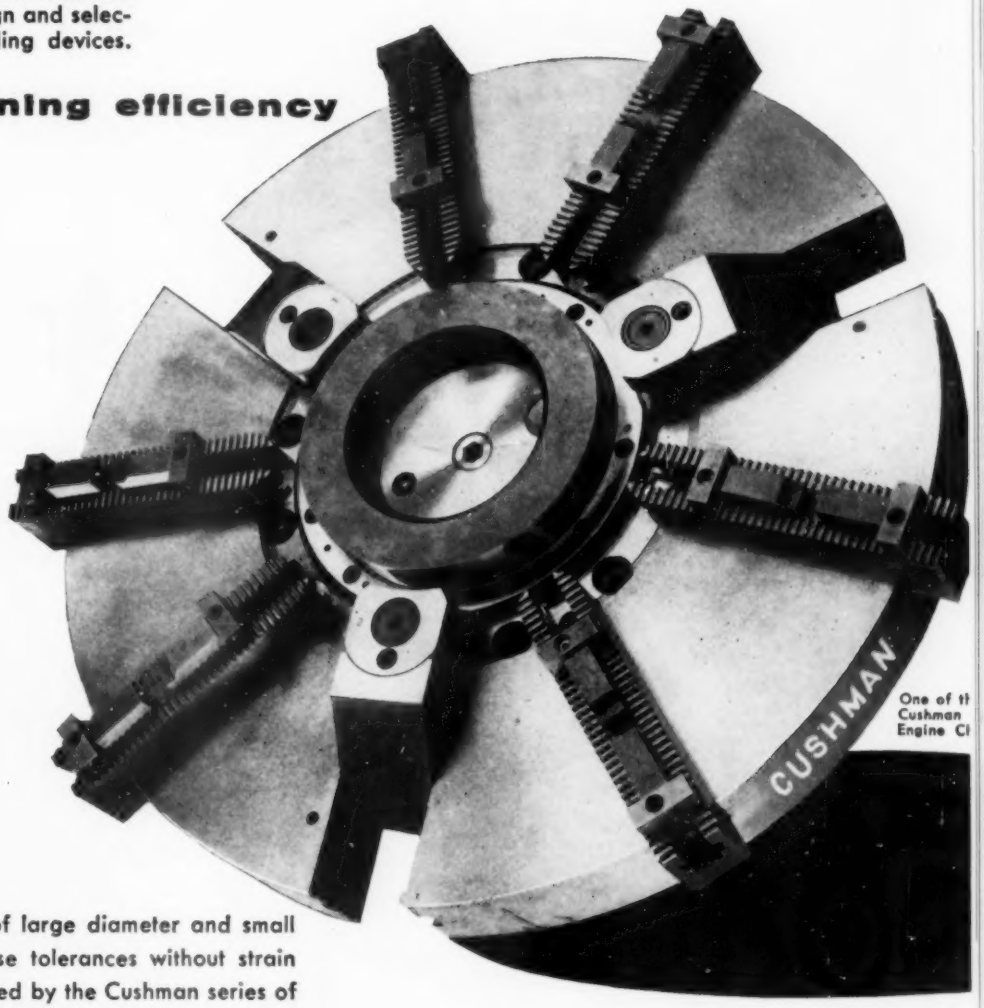
**HELLER MACHINE COMPANY**, 114 Liberty St., New York 6, N. Y.

**KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES**

# CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

**the key to machining efficiency**




One of th
Cushman
Engine Cl

Efficient machining of jet engine parts of large diameter and small cross-section to extremely close tolerances without strain or distortion was materially improved by the Cushman series of special chucks designed and built for this purpose. These chucks completely overcome the inherent difficulties of the operations and permit mass production of these vital component parts. The success of these new chucks is one more proof that Cushman gives Chuck-ability as an essential to efficient production.

Manufacturers throughout the country have long recognized and used the Cushman Engineering Department for solutions to chucking problems. We invite you to use this experienced service.

**THE CUSHMAN CHUCK COMPANY**
Hartford 2, Connecticut
a world standard for precision

CUSHMAN CHUCKMAN CHUCKS AND ACCESSORIES Exclusively 1862

CUSHMAN CHUCKS . . . *A Product of American Quality, Labor and Materials.*

**SEE YOUR INDUSTRIAL DISTRIBUTOR**

Visit us at Booth 419
Production Engineering Show
Navy Pier, Chicago, Sept. 6-17

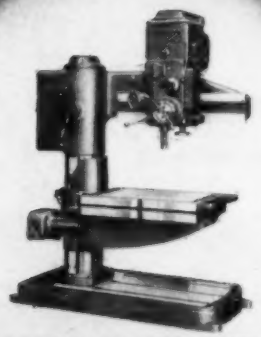
manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

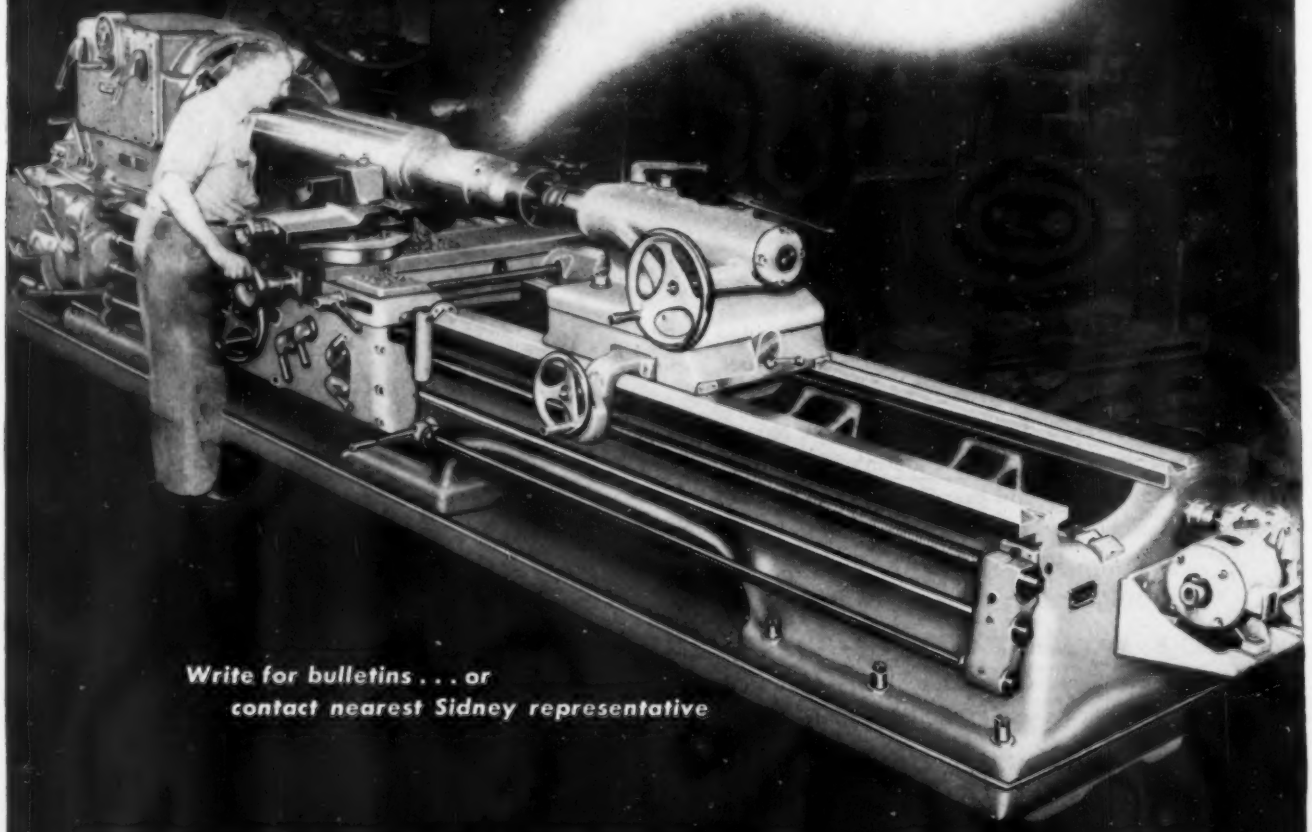
# SIDNEY
## HEAVY-DUTY LATHES

**DESIGNED FOR ACCURACY**
●
**BUILT FOR LONGER LIFE**

Here is a 32-inch Model 16 Sidney Lathe turning columns for 3 and 4-foot sensitive radial drills. Carboloy tools are being used on semi-steel. Speed: 300 feet per min. Photograph taken in plant of Fosdick Machine Tool Co., Cincinnati, Ohio.



FOSDICK RADIAL DRILL



*Write for bulletins . . . or contact nearest Sidney representative*

**THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO**

*Builders of Precision Machinery since 1904*

PARKER • MAJESTIC PM PRECISION MACHINES

*Pictured here is the home and products of*

**PARKER-MAJESTIC, INC.**

ESTABLISHED 1929

*Progress for over a quarter of a century*

**PARKER-MAJESTIC** Grinders and Spindles are among the leading Machine Tools of today.

*See the* **PARKER-MAJESTIC** *exhibit (booth No. 415) at:*

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

*DESCRIPTIVE LITERATURE UPON REQUEST*

**PARKER-MAJESTIC, INC.**

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

MAYLINE

TABLE WITH AUXILIARY UNIT

# OUTSTANDING DRAFTING FURNITURE AND EQUIPMENT

Channel reinforced covers, enclosed heavy gauge reinforced corners, gussets on flush base, folding dust cover —all are exclusive features with Mayline. Prompt delivery thru your dealer.

PLAN FILE WITH HINGED COVER

V-MODEL TABLE WITH FOOTREST

*Symbol of* MAYLINE *Superiority*

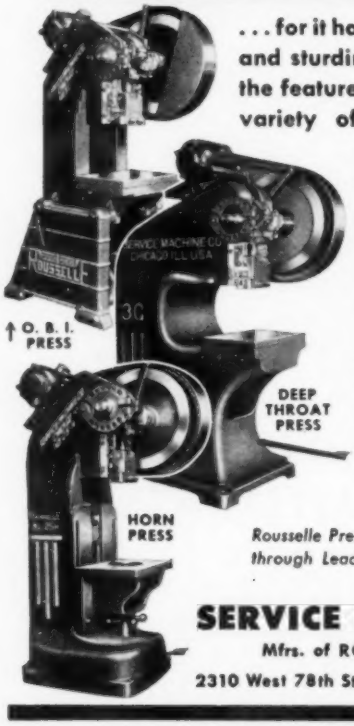
**MAYLINE COMPANY**
611 NO. COMMERCE ST.
SHEBOYGAN, WISCONSIN

MAYLINE

USE READER SERVICE CARD; INDICATE A-8-222-1

You take no chances when you choose . . .

# ROUSSELLE




. . . for it has the speed, accuracy and sturdiness you want — also the features to handle a greater variety of work — along with simpler, more thrifty operation and maintenance . . . Dollar for dollar you cannot buy a better, more practical press.

*Significant savings are often achieved if you let our engineering staff assist you. There is no obligation.*

*Rousselle Presses are sold exclusively through Leading Machinery Dealers*

**SERVICE MACHINE CO.**
Mfrs. of ROUSSELLE PRESSES
2310 West 78th Street • Chicago 20, Illinois

USE READER SERVICE CARD; INDICATE A-8-222-3

# KEYLESS DRILL CHUCKS

SLIP-PROOF

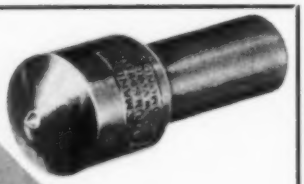
STRONGEST CHUCK MADE

TRY ONE

**K. O. LEE CO.**
ABERDEEN, S. D.

*If it's made by* **Lee** *it's a* **"Knock-Out"**

USE READER SERVICE CARD; INDICATE A-8-222-4



# WE'VE TRANSPLANTED

our plant (and offices)
to new and improved quarters at

# 111 EIGHT AVENUE

*NEW YORK 11, N. Y.*

From our new and improved quarters, we hope to serve you better than ever with the same fine quality diamonds and tools with which we have supplied you in the past.

**ANTON Smit & CO. INC.**
Manufacturers of all kinds of diamond tools
Importers of Industrial Diamonds
**111 Eighth Ave., New York 11**
**CHelsea 2-5800.**
(Note our new telephone number, too!)
formerly 333 West 52nd St., N.Y. 19, N.Y.
Please change your records.

USE READER SERVICE CARD; INDICATE A-8-222-2

# WHOOOEE!

YOU DON'T HAVE TO LOOK FAR TO DISCOVER W. H. O. * IS TOPS IN THE PRECISION SCREW MACHINE PRODUCTS FIELD.

CAP SCREWS • COUPLING BOLTS, SET SCREWS • MILLED STUDS

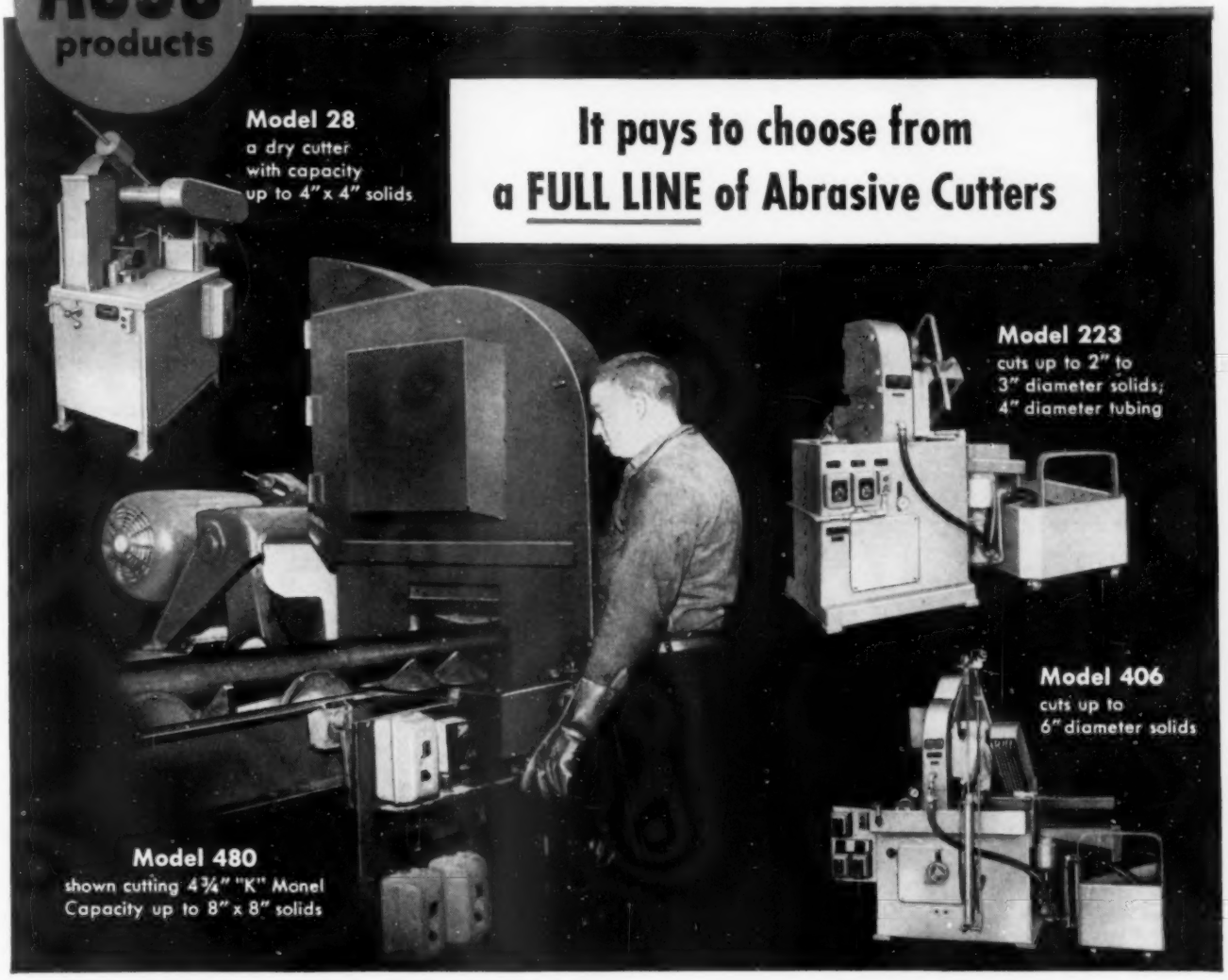
*Wm. H. Ottemiller Co.
YORK, PENNA.

Ottemiller products are sold through Mill Supply Houses. Write for free folder and price information.

USE READER SERVICE CARD; INDICATE A-8-222-5

# Campbell Abrasive Cutters

ACCO products


Model 28
a dry cutter with capacity up to 4" x 4" solids
It pays to choose from a FULL LINE of Abrasive Cutters
Model 223
cuts up to 2" to 3" diameter solids; 4" diameter tubing
Model 406
cuts up to 6" diameter solids
Model 480
shown cutting 4¾" "K" Monel
Capacity up to 8" x 8" solids

## CAMPBELL Abrasive Cutting is SMOOTH cutting —high quality at low cost

**These CAMPBELL features will save you money**

- Eliminate annealing cost when cutting forged sections from bar lengths
- No added cost for smoothing operations
- Cutting accuracy reduces scrap losses
- Metal can be cut in practically any condition

• Almost any type of material, whether hard or soft, can be economically cut by CAMPBELL Abrasive Cutters. The excellent finish obtained eliminates milling or other finishing operations in most cases.

Testing procedure by CAMPBELL Engineers will show conclusively which abrasive cutting machine will do the most economical job on your cutting application. Latest type CAMPBELL machines are available to save you time and money on every type of cutting operation.

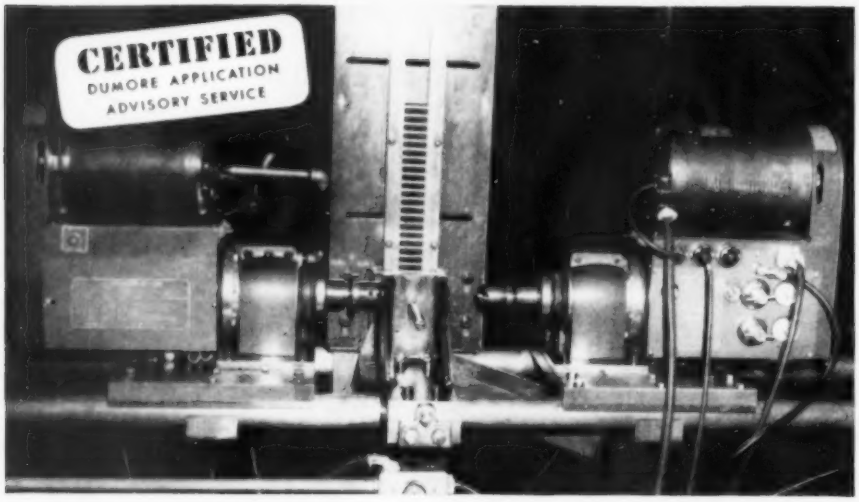
*Let us send you Bulletin DH-301 on "Principles of Abrasive Cutting"*

ACCO TRADE MARK

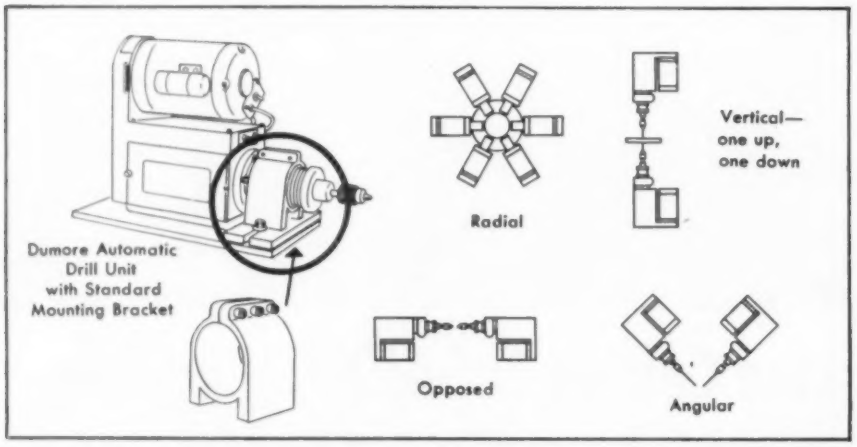
Campbell Machine Division
AMERICAN CHAIN & CABLE
945 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

# Facing-Deburring Job Speeded Up 300% with Versatile DUMORE Automatic Drill Units




**This "Special" Machine,** constructed from standard parts, faces and deburrs four times as many steel pipe sections as the previous method. As each part falls from the hopper to the fixture, an automatic switch actuates a clamping device to hold the part. The two Dumore Automatic Drill Units, also actuated, advance, face and deburr the ends simultaneously, and retract to starting position—all automatically.




**Key to Simplicity** of the Dumore Automatic Drill Unit is the standard mounting bracket which permits quick removal and transfer of Dumore Units to other shop operations. These low cost brackets quickly adapt Dumore units...at any angle...to existing shop equipment. Dumores are delivered complete and ready to be used. All controls, electrical and pneumatic are built in.

**VISIT THE DUMORE BOOTH, 547, PRODUCTION ENGINEERING SHOW, NAVY PIER, CHICAGO, SEPT. 6-16.**

Star Tubular Products Co. of Chicago wanted to step-up production of their welded steel pipe sections. A major stumbling block was the slow job of facing and deburring both ends of each section. The process required handling each part three times: facing and deburring one end, removing and reversing the part, facing and deburring the other end. Output was 135 pipe nipples per hour. Dumore was asked to find a better, faster method.

### Technical Application Aid

Dumore's Application Advisory Service recommended a set-up that resulted in the machine pictured at the left: two Automatic Drill Units opposing each other with a hopper feed for the pipe sections in the center. As each pipe section falls into the fixture, it actuates the Automatic Drill Units which move in and face and deburr each end simultaneously, retract to starting position, actuate work feed and advance again—all automatically.

### Production Goes Up

The set-up, as simple and inexpensive as it was, boosted production to 500 parts per hour—a 300% increase. In addition, the accuracy of this finishing process permitted the company to roll-cut their tubing, instead of square cutting, reducing the cut-off operation time by 300%!

The "multiple-use" value of Dumore Automatic Drill Units is still another benefit the customer gets. Its unique, simple mounting feature permits it to be quickly transferred and re-used for drilling, tapping, reaming and related operations throughout the shop, paying for itself over and over again.

**Let Dumore's Application Advisory Service help you get increased production and lower costs on jobs like this. Write for FREE Dumore Application Analysis Kit.**

DUMORE®

**AUTOMATIC DRILL UNITS**

**TOOL POST AND HAND GRINDERS**

1310
Seventeenth St.,
Racine,
Wisconsin

# DE VLIEG
## OF DETROIT

brings you a new addition to the
*Famous Microbore Line*
**OF PRECISION TOOLING**

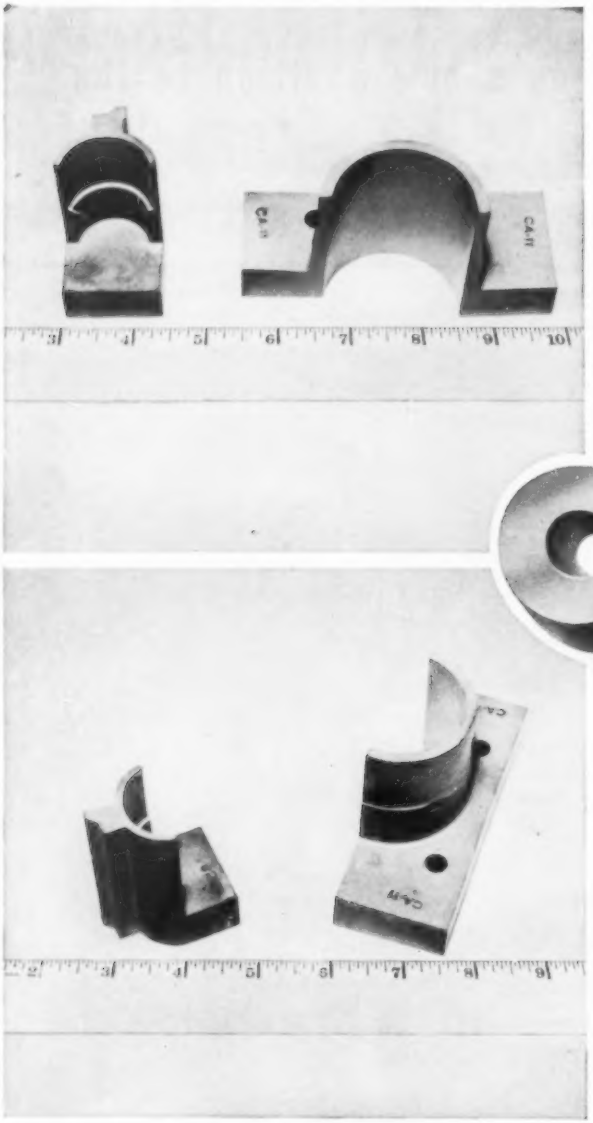
the perfect combination...
MICROBORE
FLASH CHANGE
TOOL HOLDERS
Microbore®
PRECISION TOOLING
Tools Changed in Seconds!
Positive Repositioning of Boring Bars!
Fast and Accurate Setting of Boring Tools!
A proven quick change tooling system
FOR USE ON ALL TYPES OF
BORING MACHINES and MILLING MACHINES
DE VLIEG MICROBORE CO. 2720 West Fourteen Mile Rd., Royal Oak, Mich.

***Manufacturers Representatives:*** A few desirable territories are being opened and qualified representatives are invited to visit our booth at the Machine Tool Show.

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

See the comprehensive range of Flash-Change equipment and Microbore Precision Tooling at the DeVlieg Exhibit, Machine Tool Show, at Chicago, September 6-17, Booth 1317.

**DE VLIEG MICROBORE CO.** • 2720 WEST FOURTEEN MILE RD., ROYAL OAK, MICHIGAN



# Look How You Can Save with PREFORMED CARMET®

## DIE SECTIONS

**these Blanks are preformed to a Finishing Allowance of .018"-.022" per side**

**Write for Your Copy:**
**CARMET CATALOG**

*Just out* . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order.
● *Write for your copy.*

ADDRESS DEPT. TE-68

These tungsten carbide die sections are of Carmet CA-11, a special grade developed expressly for punches, dies, and other heavy shock applications where wear and abrasion resistance are required.

These blanks have a span of 1.315" with a wall thickness of only .046", but they were easily produced to close tolerances by AL's precision preform methods. All surfaces are clean, smooth and free from defects, requiring only a minimum amount of grinding to final dimensions.

Carmet carbides can be accurately produced to practically any shape or size your designs may require, and can be supplied preformed as desired. Typical highly successful applications include inserts for drawing, heading, extruding and blanking dies; gauge and wear parts; pins; bushings; etc.

Find out, TODAY, how you can cut costs with preformed Carmet. Write or call *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Avenues, Detroit 20, Mich.*

**For ALL your CARBIDE needs, call**
**Allegheny Ludlum**
WBD 9350

AL® FINE TOOL STEELS SINCE 1854

# HOW TO GET ALONG WITH YOUR LATHE OPERATOR'S WIFE

Executives interested in pleasant labor relations would do well to talk to the wives of their employees. They would learn that a tired worker makes a grouchy husband; a grouchy husband, a discontented wife. And the effect of "family" trouble on your production can be a serious matter.

Operator fatigue resulting from repetitive manual movements can be quickly reduced in an almost unlimited number of jobs with Bellows "Controlled-Air-Power" Devices. These versatile, inexpensive, power units can perform almost any repetitive manual motion faster, safer and better than your most skilled workman. They feed work to tools, tools to work; open and close work holding devices; position and eject parts with speed and accuracy. They are easily installed on lathes, drill presses, tapping machines, milling machines, grinders, etc. They can form the "heart" of countless special purpose machines you can build in your own plant.

Not only will these versatile devices end "fatigue" problems in many of your operations, but they will enable any operator to produce more — at lower cost.

*A suggestion*

Ask your foremen what are the most tiring jobs in their departments. Then phone your local Bellows Field Engineer (he's listed in your phone book under The Bellows Co.). Ask him how Bellows "Controlled-Air-Power" can remove the fatigue from those tiring jobs.

Bulletin CL-50 (free on request) describes Bellows devices — and tells how they are used. Write: The Bellows Co., Dept. TE-855, Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., 14 Advance Road, Toronto.

**The Bellows Co.**

AKRON 9, OHIO

1222-A

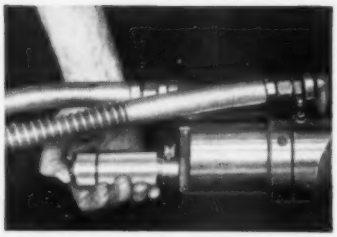
# ACTION PICTURE
## of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

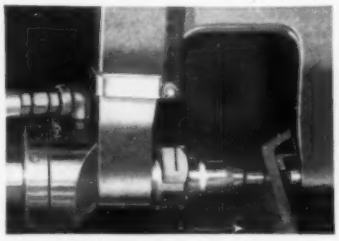
First step in assembly is to rivet the frame together...with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the ⅜" rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

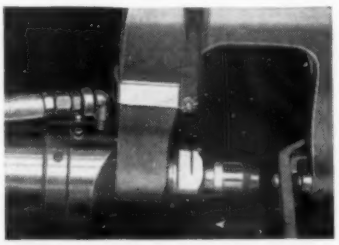
## here's the HANNIFIN "HY-POWER" WORK CYCLE



**In position.** A single control button starts (or interrupts) the automatic Hy-Power cycle.



**Ram approaches fast,** then hydraulic pressure automatically intensifies, and the rivet head is formed.



**Fast, automatic return.** Total elapsed time to head a rivet is only 2 to 3 seconds.

**"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS**

**Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.**

*do ALL you can do...with*

# HANNIFIN

Hannifin Corporation, 519 South Wolf Road, Des Plaines, Ill.
Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

# JUST LIKE PUTTING MONEY IN YOUR POCKET

***When you use R and L TOOLS on your Automatic Screw Machines and Turret Lathes you cut costs and increase production!***

**You save on . . .**

- LESS SET-UP TIME
- GREATER PRODUCTION
- LONGER LIFE
- GREATER PRECISION

These facts are attested by the tremendous amount of *repeat orders* we receive for R and L TOOLS . . . Satisfied customers ordering more and more of these tools, for they like their quality — guaranteed not to bend or give way . . . They like the precision work which can be performed with R and L TOOLS . . . And best of all, they like the money R and L TOOLS save them!

Have you tried R and L TOOLS? . . . Once you do, you'll never be satisfied with any others . . . And until you do, you are actually losing money!

*Write for new catalog*

**R and L TOOLS**
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

NAME .....
COMPANY .....
ADDRESS .....

TL-8

**RIGHT R and LEFT L TOOLS**
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

The

**Complete**

# LOVEJOY LINE of Modern Metal Cutting Tools

The Lovejoy line of inserted-tooth type cutting tools has never been more complete — or offered so many features. Every tool has been designed to give maximum production with a minimum of down time for sharpening. Lovejoy tools feature the *exclusive* "Positive-Locking" device that assures rigidity even during heavy intermittent cuts — making them rugged as solid tools. Their housings — of husky forged steel — are designed for longest life.

Lovejoy H. S. S., Carbide and Cast Alloy Blades are interchangeable in the same housing and are stocked for immediate shipment.

For standard or special cutters, call on Lovejoy — suppliers to the world's leading manufacturers for over 35 years. Write today for Catalog No. 28 which describes the full line of Lovejoy tools.

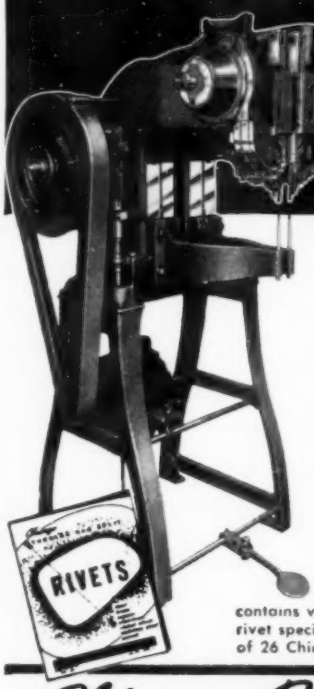
Available free on request: 3 new catalogs — on *Arbors, Face Mills, Side Mills.* Also free, the Lovejoy *Speed and Feed Calculator.* Write today!

**131 MAIN ST., SPRINGFIELD, VERMONT**

**LOVEJOY TOOL COMPANY, INC.**

USE READER SERVICE CARD; INDICATE A-8-230-1

# CUT COSTS . . . FASTEN "ON THE DOUBLE" with the Chicago "214" DOUBLE RIVET SETTER




The "214" automatically feeds, inserts and clinches two rivets at a time . . . with speed that may mean a big saving in your fastening costs.

14" throat makes large assemblies easy to handle. For up to 9/64" diameter steel tubular rivets — lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility.

Ask us how the "214" can help you cut costs. Send a sample of your problem assembly (or blueprint) for a Free fastening analysis.

**FREE CATALOG**

contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

**Chicago Rivet & MACHINE CO.**

9619 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois

*Branch Factory:* Tyrone, Pa.

USE READER SERVICE CARD; INDICATE A-8-230-3

# WORLD'S HARDEST METAL

**IMPROVED QUALITY**

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

METAL CARBIDES CORP., YOUNGSTOWN 7, OHIO

*Write for Catalog 55-G*

METAL CARBIDES CORPORATION MC TALIDE® YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

USE READER SERVICE CARD; INDICATE A-8-230-2

# DYKEM STEEL BLUE®

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

*Write for sample on company letterhead*

**THE DYKEM COMPANY**

2303D North 11th St. • St. Louis 6, Mo.

USE READER SERVICE CARD; INDICATE A-8-230-4

# Fellows

**MACHINES and TOOLS**

FELLOWS

FOR CUTTING
. . . SHAVING
. . . BURNISHING
AND INSPECTION

**in GEAR PRODUCTION**

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-8-230-5

# DOWEL PINS

## HOW TO USE THEM

**1.** Precision Dowel Pins are principally used where parts must be accurately positioned and held in absolute relation to one another whether stationary or in motion. They facilitate quick disassembly and completely accurate re-assembly.

**2.** Allen Dowel Pins are also used as plug gauges.

**3.** As plugs for determining angular dimensions of dovetail slides.

**4.** As hinge and wrist pins in applications requiring initial and permanent accuracy.

**5.** As accurate, economical roller bearings and axles.

**6.** As guide pins, stops and position locators.

## HOW TO JUDGE THEM

**1.** *On precision, for low tolerance applications.* (Allen Dowel Pins are ground to a maximum microinch finish of 6 RMS protected by a rust preventive.)

**2.** *On strength, for shear resistance.* (Allen Dowel Pins are made from special Allenoy Steel, heat treated. Single shear strength measures from 160,000 to 180,000 psi.)

**3.** *On hardness of surface and a core hard enough to prevent "mushrooming" when driven into a tight hole.* (Allen Dowel Pins have a surface hardness of 62-64 Rockwell C Scale and core hardness of 52-54. Average case depth .010 to .020 depending on size.)

**The simple sure way to be sure of uniformly superior dowel pin quality is the same as in buying precision socket screws — *get genuine Allens from your Industrial Distributor.* Only he sells them but *we will welcome your direct request for literature or application engineering assistance.***

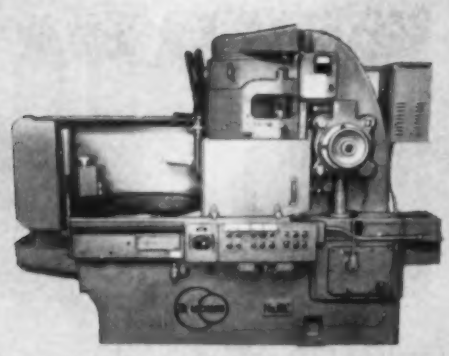
ALLEN HEAD

**ALLEN**

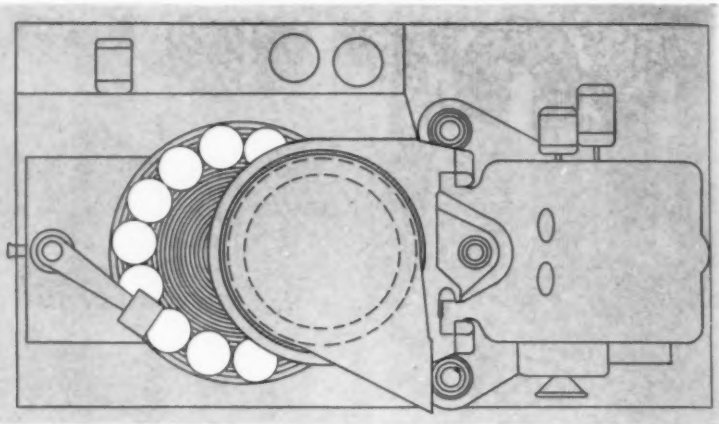
MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

Available in 108 Standard Sizes from ⅛" x ⅜" to 1" x 6". Standard tolerance .0002 oversize. Most sizes also standard in .001 oversize for repair work.

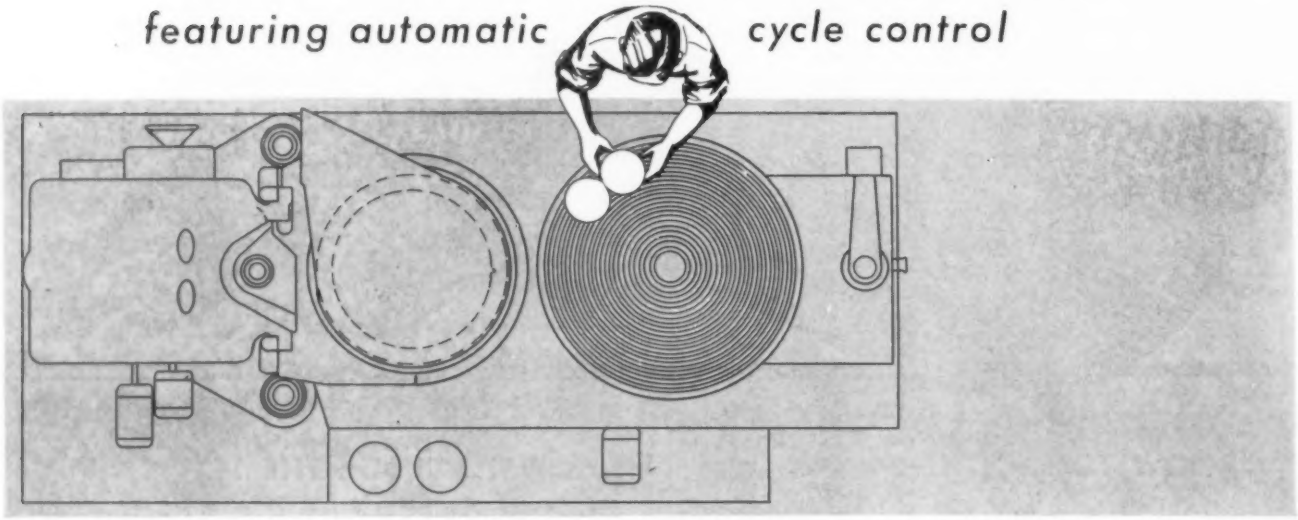


NO. 18-C BLANCHARD SURFACE GRINDER



# Plan for more profitable production with this new Blanchard Grinder

*featuring automatic cycle control*



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

The automatic cycle does everything else: moves chuck (30″ or 36″ dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

***This new Blanchard offers you many new production advantages. Look into them today — write for free catalog showing work done on the No. 18-C.***

**SEE THE 18-C AT**
**THE MACHINE TOOL SHOW**
**CHICAGO, ILL., BOOTH 406**

**PUT IT ON THE BLANCHARD**

**THE BLANCHARD MACHINE COMPANY** 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

# *30 stock answers to your gaging problems . . .

SNAP GAGES
Adjustable, for O.D., I. D., shoulders, grooves. 0" to 6" range with 2 models.

GROOVE LOCATION GAGE
Checks from face to top or bottom of groove, and deep holes or slots.

GROOVE GAGES
For "0" ring and snap ring grooves, 1/4" bore to 5". Adaptable for special applications.

BORE GAGES
For bores 1/8" to 12" dia. Two point setting with equalizers.

DEEP HOLE GAGES
For bores up to 20 feet in length. Prices on application.

COMPARASCOPE
A precision instrument for checking surface finishes.
West Coast Distributor for Hemco Gages

TEST INDICATORS
Exclusive features with .001 or .0001 accuracy.

The Reli-a-chek Gaging Group is made up of instruments that are foremost in their field, in both quality and price.

Further, Reliant's balanced line offers a single source for most gaging requirements.

All of these precision instruments have unusual and desirable features, and some unique in design and performance.

* There are many more, and some "special" ones, too.

THREAD AND GEAR WIRES
Finest quality measuring wires.

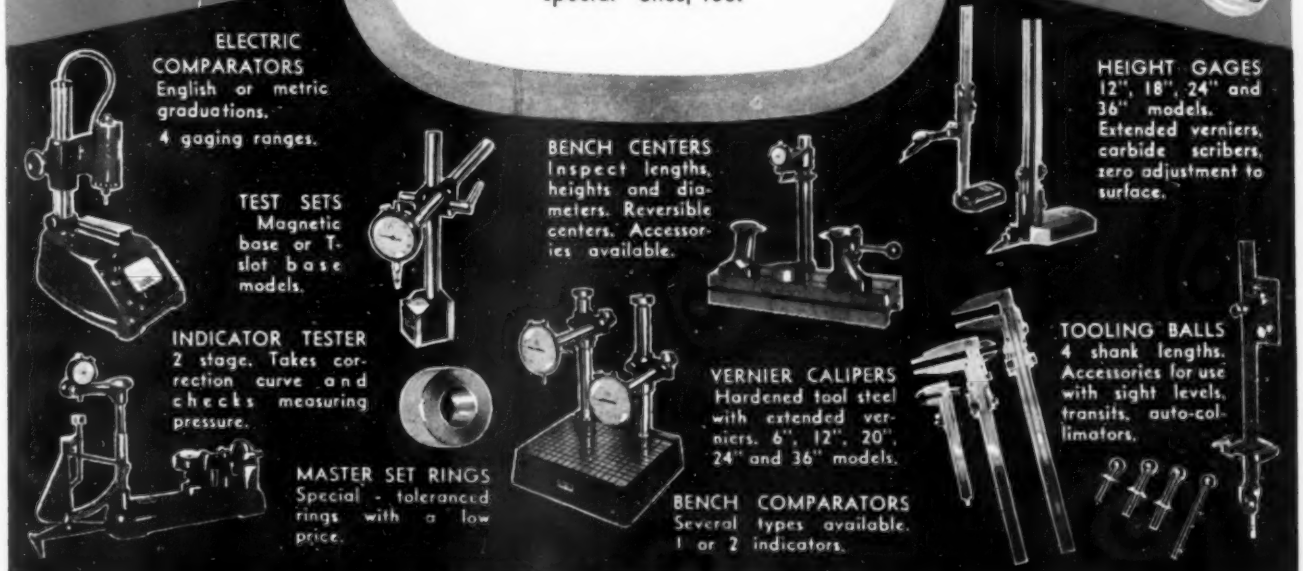
LIGHT WAVE EQUIPMENT
Wide choice of capacities, with high level of visibility.

GAGE BLOCKS
Solid square in "A" accuracy. Rectangular in "A" or "B". Round micro-gages in "B".

SURFACE PLATES
Black granite, honed surface to 50 millionths accuracy.

SINE BARS
5" or 10" sizes with projecting cylinders.

PLUG AND RING GAGES
Finest precision chrome plated gages.
West Coast Distributor for Hemco Gages



ELECTRIC COMPARATORS
English or metric graduations.
4 gaging ranges.

TEST SETS
Magnetic base or T-slot base models.

INDICATOR TESTER
2 stage. Takes correction curve and checks measuring pressure.

MASTER SET RINGS
Special - toleranced rings with a low price.

BENCH CENTERS
Inspect lengths, heights and diameters. Reversible centers. Accessories available.

VERNIER CALIPERS
Hardened tool steel with extended verniers. 6", 12", 20", 24" and 36" models.

BENCH COMPARATORS
Several types available. 1 or 2 indicators.

HEIGHT GAGES
12", 18", 24" and 36" models. Extended verniers, carbide scribers, zero adjustment to surface.

TOOLING BALLS
4 shank lengths. Accessories for use with sight levels, transits, auto-collimators.

Reliant

RELIANT GAGE & SUPPLY CO.
4947 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

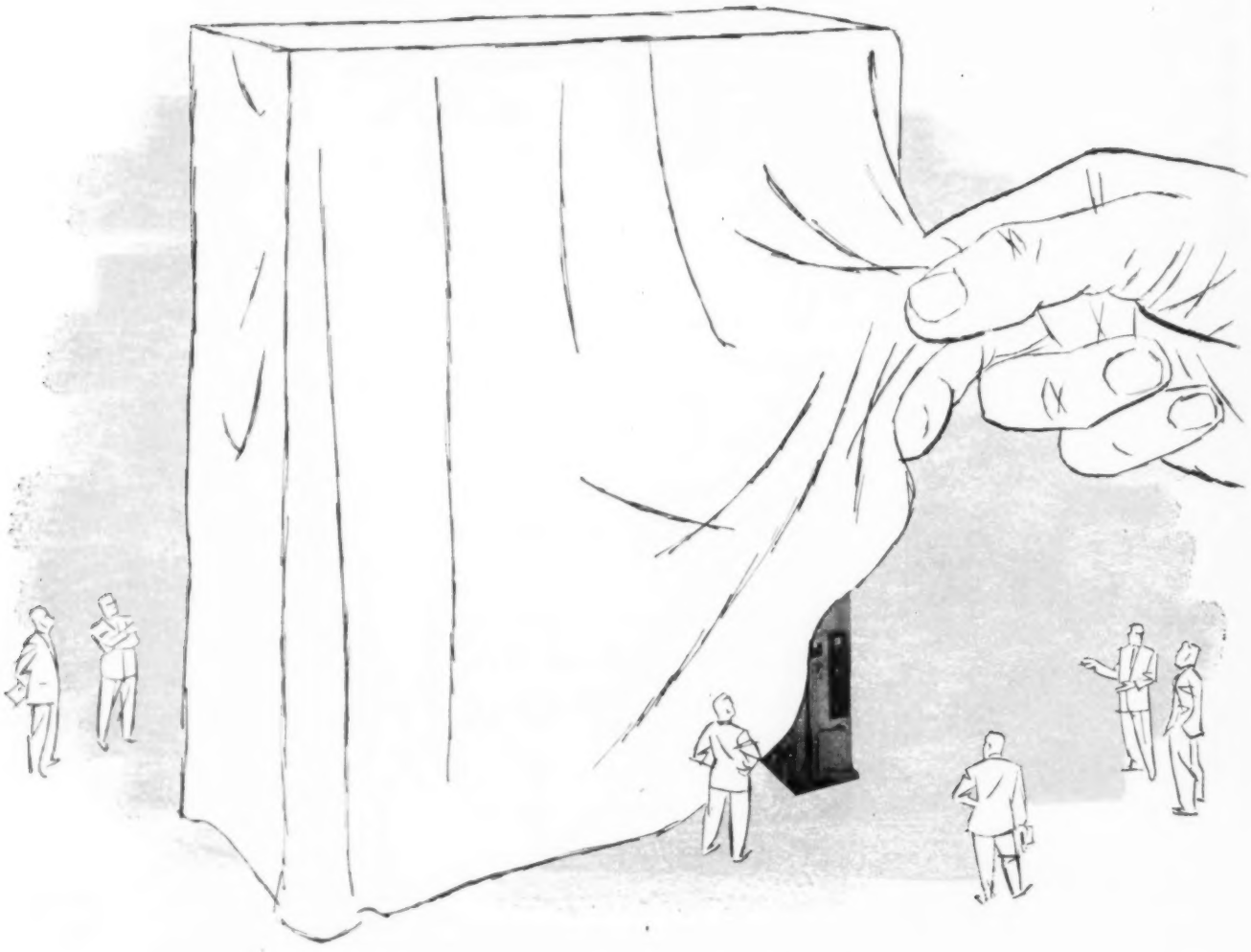
Gages

YOU ARE CORDIALLY INVITED TO THE

Verson

# OPEN HOUSE

**September 6 to 17**



## and the Unveiling of the Largest Double-Action Mechanical Press in the World

While in Chicago, during the Machine Tool Show, be sure to visit the Verson plant. Verson presses will be in operation for your examination in our new Research, Development and Exhibit Center.

Unveiling and presentation of the new Verson double-action mechanical press, the largest in the world, will take place during the Open House. It's the one event that you don't want to miss while in Chicago.

Write today. Plan your trip to the Verson Open House now. We will be pleased to arrange transportation for you between the Show, or your hotel, and the Verson plant.

*A Verson Press for every job from 60 tons up.*

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

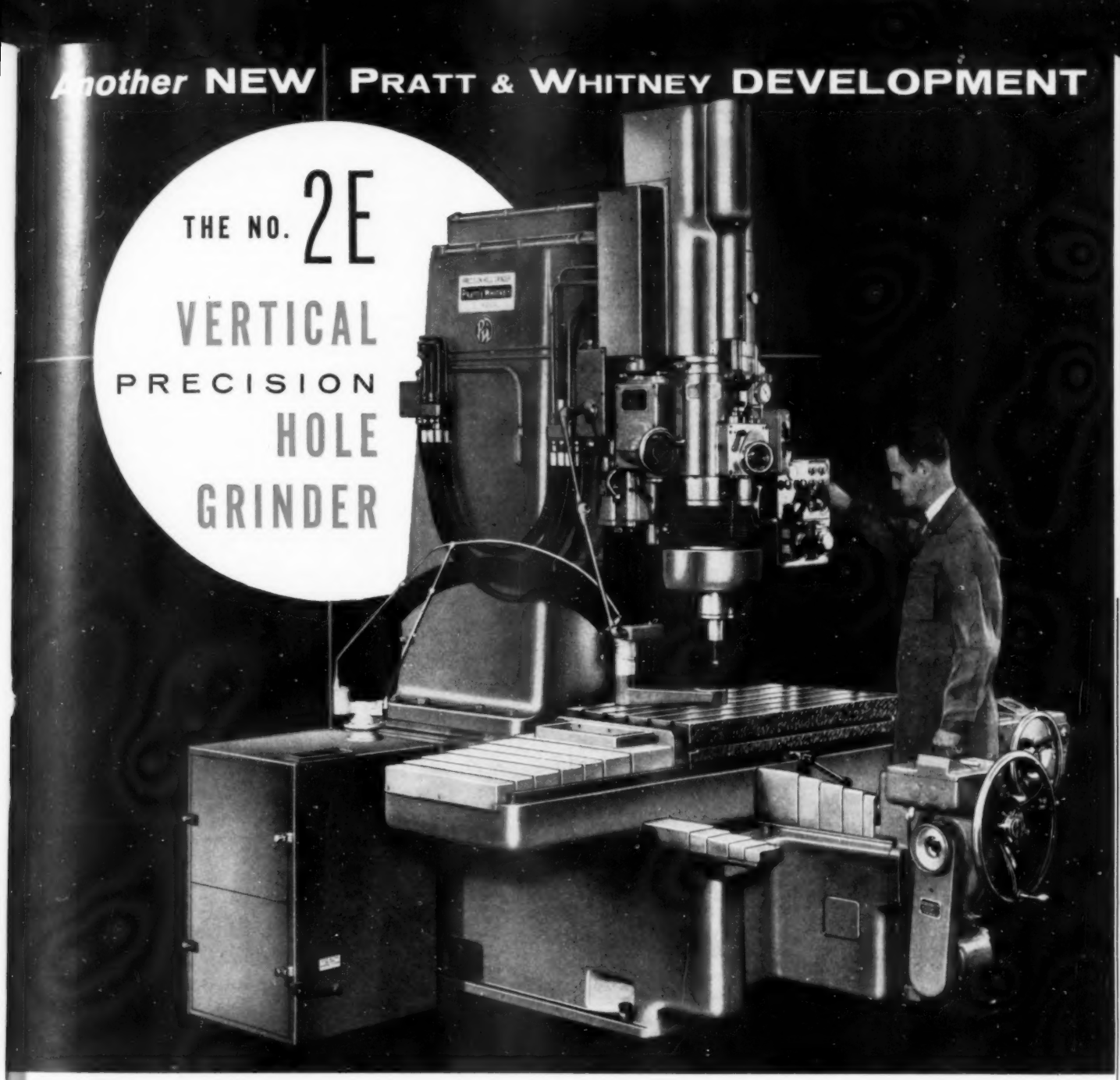
**VERSON ALLSTEEL PRESS CO.**

9336 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

*Another* **NEW PRATT & WHITNEY DEVELOPMENT**

# THE NO. 2E VERTICAL PRECISION HOLE GRINDER



- **EXTREMELY ACCURATE** . . . Incorporates the famous P & W Electrolimit Measuring System. Table settings accurate to .0001". Grinds straight or tapered holes and radii with extreme accuracy.
- **HIGH GRINDING SPEEDS** . . . Pneumatic grinding heads, of unique air bearing design, provide speeds from 4,000 to 100,000 rpm. Governor effectively maintains speed settings regardless of load changes.
- **FAST, SIMPLE, ECONOMICAL OPERATION** . . . Unlike conventional bore grinders, the 2E holds work stationary; grinding head has planetary motion around axis of hole. This — combined with fast, accurate table locating system — permits grinding holes of various sizes in a workpiece to close tolerances for size and location in a single setup. Controls for all machine motions within easy reach of operator. Time and costs are minimized.
- **VERSATILE** . . . Grinds holes up to 10" dia. Big table (22" x 44") with P&W open-side construction easily accommodates large or odd-shaped work. By adding a P&W Precision Rotary Table, any simple or compound angle can be located and ground without special fixtures.
- **DURABLE-DEPENDABLE** . . . All slide ways are protected by telescoping guards. Entire machine is designed and built to minimize wear and to retain its original high accuracy and rigidity year after year.

**PRATT & WHITNEY**

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

BRANCH OFFICES . . . BIRMINGHAM • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES
NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER
SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

**SEND NOW FOR COMPLETE INFORMATION**
Write on your Company letterhead for your free copy of P&W Circular No. 589 . . . or phone the P&W Branch Office nearest you.

. . . See the 2E in operation at Space 1219

FIRST CHOICE FOR ACCURACY SINCE 1860

MACHINE TOOLS • CUTTING TOOLS • GAGES

## Pays Off IN TIME SAVED

Types to fit any machine used for tapping or reaming.

When you compare the time it takes to make a tapping or reaming set-up with a Ziegler Tool Holder, as compared with an ordinary tool holder, you will see at once that the Ziegler pays off tremendously in time saved.

This is because, with a Ziegler Holder, all you have to do is align the work with the spindle to within 1/32" radius or 1/16" diameter and the Ziegler automatically takes care of the inaccuracy.

Simplify your set-up jobs by using Ziegler Floating Tool Holders. They're time-savers and money-savers.

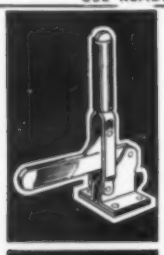
*PROMPT DELIVERY*

**W. M. ZIEGLER TOOL COMPANY**
13574 AUBURN DETROIT 23, MICH.

WRITE FOR CATALOG

**Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...**

USE READER SERVICE CARD; INDICATE A-8-236-1



WESPO

# TOGGLE CLAMPS

**Hardened steel bushings and pins provide for longer wear—eliminate elongated holes and pin shearing.**

**A CLAMP FOR EVERY WORK HOLDING NEED**

***35 Sizes Available***

WESPO TOGGLE CLAMPS are engineered and constructed for positive holding and light, medium and heavy clamping.

**See us at Booth 266**
**PRODUCT ENGINEERING SHOW**
**NAVY PIER, CHICAGO—Sept. 6-16**

**West Point Mfg. Co.**
26939 W. SEVEN MILE RD.
DETROIT 19, MICHIGAN
TWX—DE894

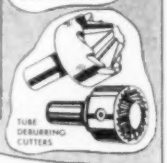
USE READER SERVICE CARD; INDICATE A-8-236-2

## HOW IMPORTANT IS CHATTERLESS COUNTERSINKING To You?

The Severance Chatterless Countersink is Engineered For Today's Fast Production Schedules. It Will Give You What You've Always Wanted In A Countersink. CHATTERLESS ACTION – SMOOTH SEATS – FAST CUTTING – LONG SERVICE.

Take advantage of last minute developments in countersink design—Save Time and Money! Order directly from this ad.

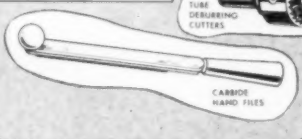
THE *Severance* LINE ALSO INCLUDES




| TOOL NO | DIAMETER | SHANK DIA | * PRICE |
|---|---|---|---|
| CB | 1/4 | 3/16 | 1.30 |
| EC | 3/8 | 1/4 | 1.85 |
| GD | 1/2 | 3/8 | 2.40 |
| JF | 3/4 | 1/2 | 4.60 |
| LI | 1 | 1/2 | 7.00 |
| PK | 1 1/2 | 3/4 | 13.65 |
| SM | 2 | 1 | 20.50 |

* PLUS 10% IN LESS THAN 10 OF ANY ITEM

**SAVE YOUR TIME!**
Order directly from this Ad, give: Tool No. and Centerline angle desired. Thus: 12 only CB-30 ; 24 only GD-41 ; etc.




ASK FOR A SEVERANCE CATALOG TODAY!

**Severance TOOL INDUSTRIES INC.**
728 Iowa Avenue, Saginaw, Michigan
*Representatives and Distributors in principal industrial areas*

USE READER SERVICE CARD; INDICATE A-8-236-3

## DIE BOOK CONTAINS CONDENSED PRACTICAL AIDS FOR EXPERIENCED DIE MAKERS

***Revised Edition Contains Answers to Over 1000 Practical Die Problems With Use of Direct Reading Tables and Formulas.***

**CUT OUT THIS AD TODAY!**
Paste on card and enclose **$4.50** for single copy. $4.00 for six or more copies. *Ten Days Free Examination.*

ALL IN ONE COMPACT HANDBOOK... direct answers to die problems. Saves time. Eliminates mathematical calculations. Avoids costly errors. Contains invaluable formulas and tables for quick reference.

Formulas and Direct Reading Die Tables on the following types of dies: Bending and Forming Dies, Blanking Dies, Drawing Dies, Square and Rectangular, Drawn Shells, Miscellaneous Tables and Charts.

**DIE TECHNIQUES, Publishers**
5005 W. LAKE STREET • CHICAGO 44, ILL.

**TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 169.**

**SPECIAL MULTI-OPERATION MACHINE TOOLS**

**NEEDLE BEARING ASSEMBLY MACHINES • INDEX TABLES**

**SELF-CONTAINED DRILL UNITS • SELF-CONTAINED TAP UNITS**

## When you are in ROCKFORD be sure to visit this plant...

We would like to have you stop in and see us. We would like to have you meet the people who conceive, design, engineer, and manufacture REHNBERG-JACOBSON Special Machines and other products. We would like you to see the up-to-date facilities that are at our command to accomplish your purposes. The REHNBERG-JACOBSON plant is an interesting one because it does not follow the conventional pattern — just as REHNBERG-JACOBSON products are often outstanding in performance because they employ ingenious new conceptions and new arrangements. You are welcome to visit any part of the REHNBERG-JACOBSON shop or offices that may interest you, and to talk with any of our people. One of our sales personnel or executives will be glad to guide you around. As a user of machine tools and allied products, you might like to know what facilities REHNBERG-JACOBSON has for satisfying your needs — and we want you to feel free to stop in and visit us the next time you are in ROCKFORD.

BOOTH 505

REHNBERG R-J JACOBSON

**REHNBERG - JACOBSON**

MANUFACTURING COMPANY

*Designers and Builders of Special Machinery*

2135 KISHWAUKEE ST., ROCKFORD, ILL.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-8-237

# Index of THE TOOL ENGINEER Advertisers

August 1955 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in ASTE Western Industrial Exposition

♦User of ASTE Data Sheets


**A**

*Ace Drill Bushing Co., Inc. ... 196
*Adamas Carbide Corp. ... 155
*Allegheny Ludlum Steel Corp. ... 226
Allen Mfg. Co. ... 231
Allied Products Corp.,
Richard Brothers Punch Division ... 16
American Broach & Machine Co.,
Division of Sundstrand Machine Tool Co. ... 148
American Chain & Cable Co.,
Campbell Machine Division ... 223
♦*American Drill Bushing Co. ... 13
American Positive Grip Vise Corp. ... 190
American Tool Works Co., The ... 14
*Ames, B. C., Co. ... 144
Anderson, F. E., Oil Co. ... 179
Anocut Engineering Co. ... 178
Armstrong-Blum Mfg. Co. ... 159
Atrax Co., The ... 44

**B**

Bakelite Co.,
A Division of Union Carbide & Carbon Corp. ... 192
Barber-Colman Co. ... 42-43
Barber-Colman Co.,
Hendey Machine Division ... 37-40
*Bath, John, Co., Inc. ... 65
Baush Machine Tool Co. ... 52
Bay State Tap & Die Co. ... 208
Behr-Manning Corp. ... 200-201
*Bellows Co., The ... 227
*Benco Collet Mfg. Co. ... 240
Bethlehem Steel Co. ... 12
Blake, Edward, Co. ... 142
Blanchard Machine Co., The ... 232
*Boyar-Schultz Corp. ... 156
*Buck Tool Co. ... 158
Bullard Co., The ... 33
*Burg Tool Mfg. Co. ... 212

**C**

Campbell Machine Division,
American Chain & Cable Co. ... 223
*Carboloy, Department of General Electric Co. ... 51
Cardinal Machine Co. ... 184
Carlton Machine Tool Co. ... 64
Case-Maul Mfg. Co. ... 150
Chicago Pneumatic Tool Co. ... 48-49
*Chicago Rivet & Machine Co. ... 230
Cincinnati Shaper Co. ... 34-35
Clearing Machine Corp.,
Division of U. S. Industries, Inc. ... 140
Cleveland Twist Drill Co. ... 203
Colonial Broach Co. ... 23
Columbia Tool Steel Co. ... 150
Comtor Co. ... 212
Cone Automatic Machine Co. ... 59
Consolidated Machine Tool Corp.,
Modern Tool Works Division ... 197
Crane Packing Co. ... 194
Cross Co., The ... 72
Crucible Steel Company of America ... 216
*Cushman Chuck Co. ... 219

**D**

*Danly Machine Specialties, Inc. ... 215
*Delta Power Tool Division,
Rockwell Mfg. Co. ... 211
Detroit Broach Co. ... 202
Detroit Die Set Corp. ... 61
*Detroit Reamer & Tool Co. ... 22
Detterbeck, Geo. L., Co. ... 190
DeVlieg Machine Co. ... 50
DeVlieg Microbore Co. ... 225
Die Techniques Publishing Co.,
Division of Falcon Engineering Co. ... 236
Disston, Henry, and Sons, Inc. ... 54
Dudco Division,
The New York Air Brake Co. ... 175
♦*Dumore Co., The ... 224
Dykem Co., The ... 230

**E**

*Eastern Machine Screw Corp., The ... 184
Eastman Kodak Co.,
Graphic Reproduction Division ... 149
Special Products Sales Division ... 193
Elgin National Watch Co. ... 212
Elgin Tool Works, Inc. ... 180
Ex-Cell-O Corp. ... Inside Back Cover

**F**

Falcon Engineering Co.,
Die Techniques Publishers, Division ... 236
*Federal Products Corp. ... 63
Fellows Gear Shaper Co. ... 230
Foote-Burt Co., The ... 60
*Frauenthal Division,
The Kaydon Engineering Corp. ... 56-57

**G**

♦*Galland-Henning Mfg. Co. ... 196
Gammons-Hoaglund Co. ... 190
♦Gardner-Denver Corp.,
Keller Tool Division ... 186
♦Gatco Rotary Bushing Co. ... 208
*General Electric Co.,
Carboloy, Dept. of ... 51
Gisholt Machine Co. ... 17-20
Greaves Machine Tool Co. ... 151

**H**

Hannifin Corp. ... 228
*Hardinge Brothers, Inc. ... 5
Hartford Special Machinery Co., The ... 181
Haynes Stellite Co.,
A Division of Union Carbide & Carbon Corp. ... 62
Heald Machine Co. ... Inside Front Cover
*Heller Machine Co. ... 218
Hendey Division,
Barber-Colman Co. ... 37-40
Hoggson & Pettis Mfg. Co. ... 196
Houghton Laboratories, Inc. ... 164
Howe & Fant, Inc. ... 145
Hydraulic Power Division,
Hydraulic Press Mfg. Co. ... 205

**J**

*Jacobs Mfg. Co. ... 167

**K**

*Kaydon Engineering Corp., The.
Frauenthal Division ... 56-57
*Kearney & Trecker Corp. ... 67
♦Keller Tool Division,
Gardner-Denver Corp. ... 186
Kennametal, Inc. ... 58

L

*Lamina Dies & Tools, Inc. ..... 173
*Landis Machine Co. ..... 8
Lapointe Machine Tool Co., The ..... 15
*Latrobe Steel Co. ..... 41
*Lavallee & Ide, Inc. ..... 171
Lee, K. O., Co. ..... 222
*Levin, Louis, & Son, Inc. ..... 212
*Lindberg Engineering Co. ..... 68-69
*Lovejoy Tool Co., Inc. ..... 230

M

Mallory, P. R., & Co., Inc. ..... 66
Mayline Co. ..... 222
Melin Tool Co., Inc. ..... 172
Metal Carbides Corp. ..... 230
Michigan Tool Co. ..... 165
*Miller Fluid Power Co. ..... 146
Milne, A., & Co. ..... 187
Modern Tool Works Division,
Consolidated Machine Tool Corp. ..... 197
Morris Machine Tool Co. ..... 11
Morse Twist Drill & Machine Co. ..... 26-27
*Motch & Merryweather Machinery Co. The ..... 21

N

National Acme Co., The ..... Back Cover
National Automatic Tool Co., Inc. ..... 213
National Broach & Machine Co. ..... 55
♦National Twist Drill & Tool Co. ..... 6-7
New York Air Brake Co., The ..... 175
Nilson, A. H., Machine Co., The ..... 168
Norton Co.,
Abrasive Grinding Wheel Division ..... 30-31
Machine Division ..... 46-47

O

*Oakite Products, Inc. ..... 214
*Ohio Crankshaft Co., The
TOCCO Division ..... 70
O'Neil-Irwin Mfg. Co. ..... 153
♦Ortman-Miller Machine Co. ..... 174
Osborn Mfg. Co., The ..... 217
Ottemiller, Wm. H., Co. ..... 222

P

Parker-Majestic, Inc. ..... 221
Parker Stamp Works ..... 166
Pines Eng. Co., Inc. ..... 204
*Pioneer Tool Engineering, Inc. ..... 36
*Portage Double-Quick Tool Co. ..... 154
Pratt & Whitney Division,
Niles-Bement-Pond Co. ..... 29, 191, 235
*Precise Products Corp. ..... 158

R

R and L Tools, Inc. ..... 229
*Red Seal Metals Co. ..... 171
Rehnberg-Jacobson Co. ..... 237
*Reliant Gage & Supply Co. ..... 233
Richard Brothers Punch Division,
Allied Products Corp. ..... 16
*Richards, J. A., Co. ..... 208
Rivett Lathe & Grinder Co., Inc. ..... 10
Robbins, Omer E., Co. ..... 162
*Rockwell Mfg. Co.,
Delta Power Tool Division ..... 211
Rotor Tool Co., The ..... 163
Russell, Holbrook & Henderson, Inc. ..... 45

S

Scherr, Geo., Co., Inc. ..... 190
Schrader's A., Son,
Division of Scoville Mfg. Co., Inc. ..... 209
Seneca Falls Machine Co. ..... 195
Sentry Co. ..... 152
*Service Machine Co. ..... 222
Severance Tool Industries, Inc. ..... 236
Sheldon Machine Co. ..... 183
Shell Oil Co. ..... 188-189
Sidney Machine Tool Co. ..... 220
*Skinner Chuck Co., The ..... 157
Smit, Anton, & Co., Inc. ..... 222
*Standard Gage Co., Inc. ..... 4
*Standard Parts Co. ..... 174
Standard Tool Co. ..... 53
Stuart, D. A., Oil Co., Ltd. ..... 210
Sun Oil Co. ..... 2
Sundstrand Machine Tool Co.
American Broach & Machine Co., Division ..... 148
Sutton Tool Co. ..... 160

T

Taft-Peirce Mfg. Co., The ..... 206-207
*TOCCO Division,
The Ohio Crankshaft Co. ..... 70
♦*Tomkins-Johnson Co. ..... 182
Torrington Co., The ..... 198

U

Union Carbide & Carbon Corp.,
Bakelite Co., A Division ..... 192
Haynes Stellite Co., A Division ..... 62
U. S. Industries, Inc.,
Clearing Machine Corp., Division ..... 140
*United States Rubber Co. ..... 32

V

Vanadium-Alloys Steel Co. ..... 199
*Vascoloy-Ramet Mfg. Corp. ..... 28
Verson AllSteel Press Co. ..... 234

W

*Wade Tool Co. ..... 9
♦*Waldes Kohinoor, Inc. ..... 143
*Wales-Strippit Corp. ..... 24-25
Wesson Co. ..... 176
West Point Mfg. Co. ..... 236
White & Bagley, Inc. ..... 185
Winter Brothers,
Division of National Twist Drill & Tool Co. ..... 6-7

Z

Ziegler, W. M., Tool Co. ..... 236



## THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

**EASTERN**
Austin G. Cragg
400 Madison Ave.
Phone: Plaza 9-4018
New York 17, N. Y.

**OHIO**
Richard E. Cleary
15515 Detroit Avenue
Phone: LAkewood 1-7125
Cleveland 7, Ohio

**CENTRAL**
Clarence T. Etter
R. Alan Cobleigh
10700 Puritan Avenue
Phone: University 4-7300
Detroit 38, Michigan

**WESTERN**
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

**PACIFIC COAST**
Robert E. Ahrensdorf
1140 Wilshire Blvd.
Phone: MAdison 9-2681
Los Angeles 17, Calif.

# BENCO COLLETS

*FOR ALL MACHINES*

**will not break off at the threads or your money back**

Due to our unique design and specialized manufacturing process we can guarantee that Benco Collets for all machines will not break off at the threads . . . on a money back or free replacement basis.

Benco Collets are made from high carbon, alloy tool steel; not carburized steel. The threads have a tensile strength of more than 175,000 per square inch. Benco Collets have a guaranteed accuracy of .001 run-out per inch of bar extension from the face of the collet.

With all their extra features and your money-back guarantee, Benco Collets for all machines cost no more than ordinary collets. You can save trouble, time and money by using Benco Collets . . . they assure you maximum satisfaction regardless of the size and type of material you use. You can't lose when you buy Benco Collets for all your machines . . . they won't break off at the threads or you get your money back or a free collet. Specify Benco every time—for quality—for value—for performance.

Above is a 1" collet removed from a 1" machine. Imagine the cost of the wreck this collet caused! These two pieces had to be removed from the machine and a new collet installed with loss of time and production.

The Benco Collet shown at the left, due to special engineering, will not break off at the threads.

*the* **BENCO** *line includes:*

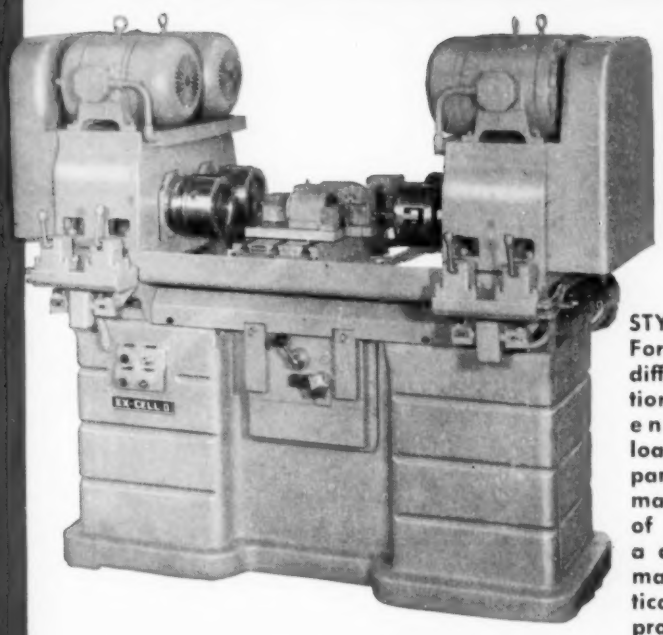
- Master Pushers and Pads
- Master Collets and Pads
- Pushers and Feed Fingers
- Solid Collets
- Ejector Collets
- Carbide-faced Stock Stops for B. & S. Machines
- Collet Sleeves and Chuck Nuts for B. & S. Machines

## Benco COLLET MANUFACTURING CO.

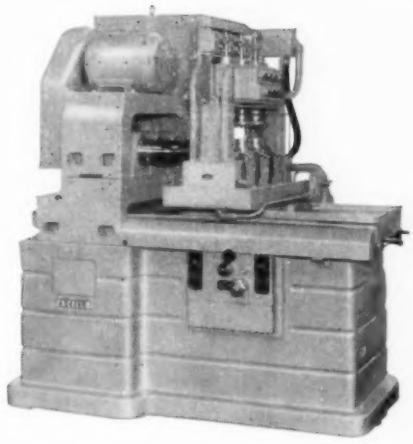
CLEVELAND 14, OHIO

**REPRESENTATIVES:** Ternquist Machinery Company, Los Angeles, Calif.; Dorow Machine Tools, Wichita, Kan.; Harry Dunn Corp., Houston, Texas; J. K. Bousum Co., Detroit, Mich.; Walter J. Greenleaf Co., Pittsburgh and Erie, Pa.; Hespelhorn Tool & Supply Co., Dayton, Ohio; Kel-Sir Company, Milwaukee, Wisc.; Mason & Luttrell Sales Eng., Okemos, Mich.; Fred J. McMillen, Providence, R. I.; Pearse-Dengel Tool Company, Hasbrouck Heights, N. J.; Philadelphia Tool Company, Bala-Cynwyd, Pa.; Erwin A. Slate, Gasport, N.Y.; W. C. Straub, Cleveland, Ohio; G. W. Wittlinger, Chicago, Ill.; J. E. Dilworth Company, Memphis, Tenn.; H. M. Scherling, Minneapolis, Minn.; Die Makers Supply Co., Kansas City, Mo.; H. F. Soderling Co., Seattle, Wash.; Production Tools, Toronto, Canada.

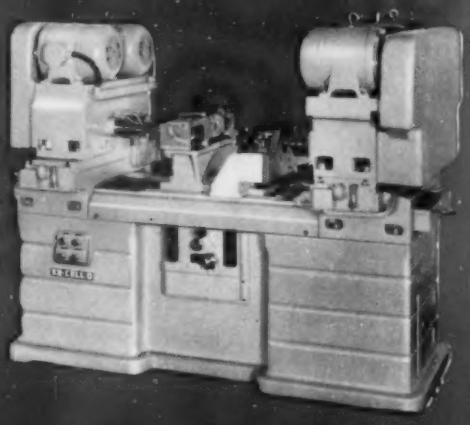
STYLE 2112-A. Single-end model for work pieces in the small and medium-size range. Flexible hydraulic controls give easy adjustment of multiple operations.



STYLE 1212-A. For identical or different operations at each end. When loading time of parts approximates the time of machining, a double-end machine practically doubles production.



STYLE 112-C. Large and sturdy with long stroke. Accommodates medium and heavy work, gives maximum precision production, minimum operating cost.



STYLE 17. Massive construction. Maintains the highest precision standards on a profitable production basis. Economical in operation, can be tooled for a wide range of production jobs.

## WHICH MODEL FITS YOUR PRODUCTION?

# Ex-Cell-O Precision Boring Machines

XLD

EX-CELL-O *for* PRECISION

You can precision-bore, turn, face, counterbore, chamfer, or groove with these fast, sturdy, flexible EX-CELL-O machines.

These are standard machines that handle many kinds of precision operations. EX-CELL-O has the *standard items of tooling* to make this possible at minimum cost.

Any EX-CELL-O Precision Boring Machine will give you *precision work at maximum production* speeds, with a minimum of investment.

Get all the facts about them from your local Ex-Cell-O representative, or write for a Precision Boring Catalog.

**EX-CELL-O CORPORATION**

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

EE-10

## carbides?

**IMPELLER HUB** — 4" diam., 1¼" long, from SAE 1146 annealed steel forging. JOB ANALYSIS determined multiple-spindle chuckers with ALL CARBIDE tooling.

11 operations on first side, on 6" Acme-Gridley 8-spindle chucker with double indexing and duplicate tooling. 2 pieces per cycle in 22½ seconds machine time — 320 pieces per hour.

17 operations on other side on single indexing 6" Acme-Gridley 8-spindle chucker. 26 seconds machine time — 138 pieces per hour.

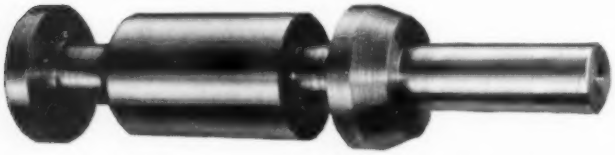
## high speed?

**SEAL RING** — ½" thick, from 2½" diam. steel 6150 annealed. JOB ANALYSIS classed this as single-spindle job with HSS tooling.

5 shoulders rough and finish-formed to .002 tolerance, seat diam. held to .0005 tolerance, on 3½" single-spindle Acme-Gridley bar-type turret lathe. 7 minutes machine time — 8 (plus) pieces per hour.

Spindle speed automatically changed 4 times during cycle to provide suitable speeds and feeds for required finish.

## or BOTH?



**SHAFT** — 7¾" long, from 1⅞" diam. steel 6250 annealed. JOB ANALYSIS indicated single-spindle bar-type turret lathe, with part CARBIDE and part HSS tooling.

10 operations including deep forming, turning and form-turning on 3½" single-spindle Acme-Gridley bar-type turret lathe: 5 minutes 46 seconds machine time — 9 (plus) pieces per hour.

5 automatic changes of spindle speed during the cycle provided speeds and feeds best suited for using both HSS and Carbide tools.

# let the job analysis dictate the right tooling method

**(And the Right Machine)**

*All* Acme-Gridleys are built with a rigidity factor to withstand the pressure of *any* cutting tool yet devised—at speeds as fast as modern cutting tools can "take it." With such a margin of power, speed and stamina built into each of National Acme's COMPLETE LINE of multiple- and single-spindle bar and chuck-type automatics, you can safely let the job analysis dictate:

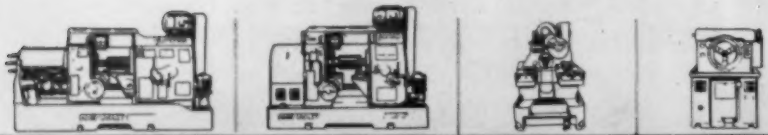
1. **The best tooling method.**
2. **The machine best suited to produce the job most economically.**

And you can be equally sure that tooling recommendations from National Acme will be based upon sound, experienced judgement.

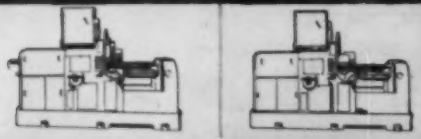
If you would like a complete job analysis, we'd be glad to give you the benefit of our experience.

**BOOTHS 324 AND 705**

**You can see National Acme's COMPLETE LINE IN ACTION at the Machine Tool Show. Study these modern machines. Ask questions. Then you'll learn why Acme-Gridleys are your best investment — for greater productivity today, and to maintain "new-machine-productivity" longer.**



**OUR JOB: to provide the *Right Machine* for YOUR JOB**



**Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.**

## THE NATIONAL ACME COMPANY

184 EAST 131st STREET • CLEVELAND 8, OHIO